The Honorable James L. Robart

UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF WASHINGTON
AT SEATTLE

MICROSOFT CORPORATION, a Washington corporation, Plaintiff, v. MOTOROLA, INC., MOTOROLA MOBILITY LLC, and GENERAL INSTRUMENT CORPORATION, Defendants.	CASE NO. C10-1823-JLR MOTOROLA MOBILITY'S AND GENERAL INSTRUMENT'S PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW **REDACTED**

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PROPOSED FINDINGS OF FACT

I. STANDARD-SETTING ORGANIZATIONS AND RAND OBLIGATIONS

1. Standard-setting organizations ("SSOs") are voluntary organizations whose participants engage in the development of telecommunication and information technology standards. The 802.11 Standard is a wireless communication standard that was developed over a period of years by the Institute of Electrical and Electronics Engineers ("IEEE"). The H.264 Standard is a video coding standard that was developed over a period of years by the International Telecommunication Union ("ITU"). Motorola[1] made significant technical contributions to both the IEEE and ITU standards.

2. Robust technical standards are critical to products in today's markets. Technology standards promote efficiency and innovation by making it easier to create products and services that interoperate with each other. This interoperability and compatibility among technologies and products benefits consumers and has made standards a market necessity. The increased efficiency created by the implementation of standards generates economic benefits for the industry.

3. One goal of the IEEE and ITU is to develop standards that incorporate the best technology available, even if those standards include the use of known patents. The SSO rules and procedures typically request participants who believe they are contributing patented technology that is essential to the standard to identify the patents covering such technology (or to identify themselves as the holders of such standard essential patents ("SEPs")) and provide an assurance that the participant is willing to grant a license to any such patent on reasonable and non-discriminatory ("RAND") terms to all applicants. This is known as the RAND commitment.

4. The RAND commitment and the SSO rules and procedures balance the rights of patent owners with the needs of the implementers of the standards. As Microsoft stated in a June 14, 2011 letter to the Federal Trade Commission, "[t]hrough balanced IPR policies that help make innovative technology available to implementers on reasonable terms, and that do not

[1] For purposes of the Proposed Findings of Fact, MML, MMI, MSI and GI are collectively "Motorola."

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undercut the value of patented technology or overly burden patent holders, standards can help to catalyze innovation by encouraging companies to contribute their innovative technology to collaborative standards setting activities and to share their intellectual property with others via the standardization process. Standards will not fulfill their salutary purposes if standards policies deter innovators from contributing patented technologies or investing in further innovation related to standardized technology."

5. The IEEE refers to the assurance that a SEP holder is willing to grant RAND licenses as a "Letter of Assurance," while the ITU refers to such an assurance as a "Patent Statement and Licensing Declaration." Collectively, these are often referred to as "LOAs." The current IEEE form LOA provides an option for submitters to indicate a "not to exceed" royalty rate, and one of the options is "percent of product price." No party has submitted an LOA containing a royalty term to the IEEE for any of the 802.11 standards.

6. The ITU has published a "Common Patent Policy for ITU-T/ITU-R/ISO/IEC/." This policy states that a standard's "objective is to ensure compatibility of technologies and systems on a worldwide basis;" and although the standard "must be accessible to everybody without undue constraints[,]" "[t]he detailed arrangements arising from patents (licensing, royalties, etc.) are left to the parties concerned, as these arrangements might differ from case to case." Also, the ITU Policy and its licensing declaration form further state that "negotiations are left to the parties concerned and are performed outside the [ITU]."

7. Section 6.2 of the IEEE's Policies and Procedures Section addresses patent issues. This section states that "a [Proposed] IEEE Standard may require the use of a potential Essential Patent Claim[,]" and in such cases "the IEEE shall request licensing assurance . . . from the patent holder or patent applicant[,]" but "[n]o license is implied by the submission of a Letter of Assurance." The IEEE bylaws further state: "The IEEE is not responsible . . . for determining whether any licensing terms or conditions provided in connection with submission of a Letter of Assurance, if any, or in any licensing agreements are reasonable or non-discriminatory."

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8. The IEEE and ITU focus on technical issues, and do not engage or participate in negotiations about licensing terms and conditions. The IEEE and ITU have declined to provide a definition of what constitutes RAND terms and do not attempt to determine what constitutes a reasonable royalty rate or what other terms and conditions are reasonable or nondiscriminatory.

9. The IEEE and ITU leave determining RAND terms to the patent holder and the potential licensee to decide through good faith, bilateral negotiations outside of the activities of ITU and IEEE. As the ITU's Legal Officer indicated "licences and their prices are generally nego[t]iated on a bilateral basis between the patentee and each licencee, outside the [SSOs]." RAND-based IPR policies provide a flexible framework to help enable customized bi-lateral negotiations for patent licenses that generally are not limited to just the essential patent claims in connection with a standard.

10. Neither the IEEE nor the ITU require parties to disclose RAND terms during the standard setting process. In fact, the IEEE has guidelines that preclude discussions of license terms at technical standards-development meetings. Specifically, the IEEE's Antitrust and Competition Policy Guidelines state that participants cannot discuss: "[s]pecific patent license terms or other intellectual property rights, other than distribution of Accepted Letters of Assuranc*e* as permitted under the IEEE-SA patent policy."

11. The ITU's and IEEE's IPR policies do not require or contemplate that RAND licenses will have a single common royalty rate for all potential licensees and do not require or preclude any particular structure for a RAND royalty.

12. SSOs recognize that "terms and conditions" of a RAND license agreement encompass more than just a royalty rate. For example, the ITU letter of assurance form expressly allows parties to condition their RAND obligation on the potential licensee's willingness to grant a reciprocal RAND license to its own standard-essential patents, and reciprocity is understood as a common RAND term. These additional non-royalty terms and conditions may influence the actual royalty rate present in a particular agreement.

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13. RAND commitments are designed to ensure that a SEP holder will not engage in "hold up." Patent "hold up" could occur if a SEP holder insists on an unreasonable rate for its SEPs. Microsoft's position on hold up (as well as many other RAND-related issues) is set forth in its June 14, 2011 letter from David Heiner, Microsoft's Vice President and Deputy General Counsel, and Amy Marasco, Microsoft's General Manager, Standards Strategy and Policy, to the Federal Trade Commission. Royalty stacking is another potential issue with SEP licensing. "Royalty stacking" is the cumulative "stacked" royalties that a licensee may need to pay to all holders of SEPs for a given standard. There is no empirical evidence of a stacking problem as to the 802.11 or H.264 standards.

14. Motorola, Inc. and Symbol Technologies have submitted LOAs to the IEEE for certain patents that they assert are essential to the 802.11 standard.

15. Microsoft has submitted LOAs to the IEEE for certain patents that it asserts are essential to the 802.11 standard.

16. Motorola, Inc., MMI and GI have submitted LOAs to the ITU for certain patents that they assert are essential to the H.264 standard.

17. Microsoft has submitted LOAs to the ITU for certain patents that it asserts are essential to the H.264 standard.

II. RAND AGREEMENTS IN THE MARKETPLACE

18. RAND license terms and conditions are generally determined on a case-by-case basis through bilateral negotiations between licensors and licensees. [redacted]

19. RAND licenses are typically complex agreements that usually require both extensive negotiations to account for the unique circumstances of each licensing situation, as well as the exchange of sensitive and proprietary business information. For example, parties often exchange (1) confidential technical information that supports a non-infringement argument

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or that supports an argument that the royalty should be reduced for a particular product, (2) confidential financial information, such as past and future projected sales of products to be covered by the license and geographic location of sales; and (3) confidential information about the importance and relevance of the patented technology to products and services of the licensee.

20. It is industry practice to cross-license standard-essential patents on a portfolio basis, taking into account respective market positions, industry conditions and other commercial considerations. During license negotiations, the parties typically discuss and evaluate the scope, use, and number of patents in each party's patent portfolio. The parties also typically consider economic analyses of the extent of past and anticipated future usage of each party's patents.

21. RAND license agreements include a range of non-monetary material terms. These can include the assignability; term or duration of the license; the scope of the field of use; the extent to which patents resulting from pending patent applications are included in the license; the geographic scope of the license; the release(s) granted to each party; any exclusions from either the licensed patent portfolios or the field of use; and whether a defensive suspension or termination clause will be included to protect a licensor who has been sued.

22. Royalty rates in patent licenses are commonly stated as a percentage of sales (such as gross or net sales revenue) for a number of reasons, including ease of accounting, efficiency, and because the royalty will adjust as the price adjusts (thus, as a product decreases in price, so will the royalty). [redacted]

III. MICROSOFT'S (AND THE INDUSTRY'S) UNDERSTANDING OF RAND

23. On June 14, 2011, David Heiner, Microsoft's Vice President and Deputy General Counsel, and Amy Marasco, Microsoft's General Manager, Standards Strategy and Policy, submitted a letter to the Federal Trade Commission on behalf of Microsoft in response to the FTC's May 13, 2011 Request for Comments and Announcement of Workshop on Standards-

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Setting Issues regarding "patent holdup" in connection with standardization efforts, which was part of the FTC's Patent Standards Workshop, Project No. P11-1204. In its letter, Microsoft stated:

a. "Concerns about 'patent hold-up' should not extend to any bi-lateral business disagreement between two companies regarding proposed licensing terms. These discussions typically pertain to a broader set of questions than just the proposed licensing terms for essential patent claims reading on a standard. In addition, if the Government were to attempt to quasi-regulate RAND licensing terms, then they arguably should review the inter-play among all of the substantive terms (and not just the monetary component) for all aspects of patent licensing terms. Yet that would likely be unworkable."

b. "RAND-based IPR policies provide a flexible framework to help enable customized bi-lateral negotiations for patent licenses that generally are not limited to just the essential patent claims in connection with a standard."

c. "The concept of 'patent hold-up' should map to marketplace realities."

d. "The notion that "patent hold-up" is a substantial problem that should be addressed by government action seems to stem from a largely theoretical analysis of the situation. If a patent holder can charge implementers more than a reasonable royalty because those implementers are (perhaps) 'locked into' the standard, then is it not likely that it would take advantage of this opportunity? We believe that this reasoning greatly over-simplifies – and obscures – the realities of standards-related patent licensing. How any individual company will approach patent licensing will depend on many factors, such as: [(1)] What is the company's primary business model implicated by the relevant standard? [(2)] Is it likely that the company will proactively seek patent licenses (either as a licensor, a licensee or both)? [(3)] Who are the likely companies holding essential patent claims, and what are their business models, products and patent

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portfolios? [(4)] What licensing or other agreements are already in place between the parties? [(5)] If the parties decide to enter into an agreement, then what are al1 of the issues (including all of the IPR-related issues) that likely will be negotiated? [(6)] Are there trade-offs that may be made with regard to royalty payments or other financial terms? For example, there are companies who sometimes are willing to offer their essential patent claims to a particular standard free of charge, but they also include a defensive suspension clause that causes the free license in connection with these patent claims to terminate if the licensee commences litigation against the licensor on any grounds whatsoever. As a result, we respectfully suggest that a simplified and theoretical approach to defining 'patent hold-up' may not sufficiently map to complex marketplace realities. It may pull in what are essentially routine business negotiations between two parties. These negotiations almost always include considerations beyond the proposed licensing terms for just the essential claims in a standard (and just the royalty element of any such terms). Many companies question whether these types of business negotiations should be labeled as 'patent hold-up' and scrutinized by regulators. We believe that there is an important difference between intentional or deceptive conduct in connection with patents that read on standards and routine bilateral disagreements over licensing terms for the use of patented technology."

e. "Depending on their applicable business model, many companies largely use their patents vis-à-vis standards defensively. Far from seeking to 'hold up' implementers, these firms will not seek patent royalties at all in the ordinary course of business. Rather, they will seek a patent license from an implementer only when that implementer has first challenged them on other patent infringement issues."

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f. "In addition, it is important to consider the healthy competition among different business models and how that influences debates regarding 'patent hold-up' and whether there is a need to impose further restrictions on patent holders. Some companies are largely innovators who predictably will seek a return on their investments in innovation through licensing their patents. Some product-based companies take a more nuanced position, often using their patents vis-à-vis standards defensively (as described above). Still others have a significant consulting or integration services focus, and they may benefit from having access to others' innovative technology in standards at a reduced cost if not for free. The current RAND-based structure balances these different interests. Proponents seeking to tilt that balance may largely be seeking reduced licensing costs and a related competitive advantage as opposed to solving a documented and widespread problem."

g. "RAND is a time-tested and effective approach to licensing commitments. Like other 'reasonableness' standards, it does not dictate specific licensing terms, but it does provide flexibility across a diverse range of situations. As mentioned above, companies make decisions about whether to initiate licensing discussions and, if so, what considerations beyond just the essential claims vis-à-vis the final standard will be included. The negotiation associated with a standards-related patent license typically is no different from any general patent licensing discussion and will involve trade-offs on all of the terms and conditions."

h. "There is little evidence that 'patent hold-up' in the standards context is a real problem. Most patent holders also are implementers, whether with regard to the same standard or in terms of the broader ICT standards landscape, and thus share an interest in maintaining reasonable royalty rates. This ecosystem generates few IPR-related disputes as a result."

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24. Amy Marasco, Microsoft's General Manager of Standards Strategy and Policy, has explained that:

a. "FRAND is a rather fluid concept," the "Pros" of which are that "No one-size-fits-all approach and no blanket rules provides needed flexibility," it is "[h]ard to generalize about what FRAND would *be* for different scenarios or different 'types' of standards"; and that "[c]ompanies look at licensing (whether theirs or others') on a case-by-case basis depending on the specific technology, the marketplace and their relevant business model."

b. "At the end of the day, all of the companies in the debate are motivated by the potential impact of various patent policy approaches on their bottom line. This should not come as a surprise; they are legally obligated to consider shareholder value as a priority concern."

c. "RAND is not formulaic; different IP is worth different amounts. A number of IP holders may disclose essential patent claims and commit to 'RAND' licensing terms, but they do not actively seek licenses from implementers; their use of their IP is defensive when someone comes knocking on their door."

25. A TIA presentation naming Microsoft's Amy Marasco as a "contact" indicated that: "Conclusion: RAND/FRAND Works and Works Well!," that "Criticisms made against the RAND/FRAND regime fail to convince those who take the time to understand the issues," and that "[e]fforts to move away from RAND/FRAND or to re-interpret it are essentially motivated by a desire to reduce prices paid for patented technology or get access to IPR."

26. In explaining patent hold up, Amy Marasco stated that "Hold up certainly does not exist merely by the fact that a patentee charges a particular rate for its royalty when licensees would prefer a lower rate."

27. Amy Marasco and Microsoft stated in a presentation that group discussion of disclosed licensing terms as the standards body "can lead to group boycott conduct, buyer cartel

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behaviors, and other anti-competitive conduct," could "violate the anti-trust laws," and could "have negative impacts on dynamic efficiencies." Marasco added that she was "[n]ot aware of any standards body that permits this today."

IV. THE 802.11 STANDARD AND THE PARTIES' 802.11 PATENTS

28. The 802.11 Standard is a wireless communications standard colloquially known as "Wi-Fi."

29. The 802.11 Standard is the most widely-used and universally accepted wireless communications standard for ordinary consumer and business use. In recent years, there has been a steadily predominant trend to provide 802.11-compatible Wi-Fi in personal computers, laptops, video game consoles, cellular telephones, smart phones, and many other consumer and business products that include communications and/or data transmission capability.

30. A patent is deemed "essential" to the 802.11 Standard if any of its claims is essential. An essential patent claim is a claim that is "necessary to create a compliant implementation of either mandatory or optional portions of the normative clauses of the [Proposed] IEEE Standard when, at the time of the [Proposed] IEEE Standard's approval, there was no commercially and technically feasible non-infringing alternative."

A. Motorola's Patents

31. There are at least 48 Motorola U.S. patents, and many foreign counterparts to those patents, that are essential to the practice of the 802.11 standard. These 48 patents are distributed among 23 patent "families." A family consists of a "parent" United States patent, together with related patents that are either United States continuations or divisionals of the parent, or foreign counterparts to one of the United States patents.

32. The 23 Motorola families of 802.11 essential patents can be grouped into seven general technological categories: (A) network setup and channel access management; (B) data modulation techniques; (C) security and encryption; (D) power management; (E) low density parity check codes; (F) data fragmentation; (G) fast transitions; and (H) mesh networking.

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33. Microsoft states that its Xbox products comply with the 802.11 Standard. Of the 23 Motorola families of 802.11 essential patents, at least 11 families claim subject matter that is used in Microsoft's Xbox products.

34. Motorola's essential patents, including in particular the 11 families that disclose subject matter used in Microsoft's Xbox products, are predominately directed to important core aspects of the 802.11 Standard that are necessarily and widely used by devices that are compliant with the 802.11 Standard.

35. There are no alternative approaches to the 802.11 technologies covered by the Motorola essential patents that have been shown to have been actually considered for implementation by the 802.11 IEEE Standards Organization. Nor has it been shown how any purported alternative would or could have been implemented in the Standard and, if implemented, how the Standard would have been amended or rewritten, and what technological or commercial advantages or disadvantages would have resulted from such alternative implementation.

36. Exhibit 3320 is a summary chart identifying Motorola's 802.11 essential patents, their technological groups, and Xbox usage.

B. Microsoft's Patents

37. Microsoft owns 6 families of patents that it asserts are essential to the 802.11 Standard.

38. At least 4 of the Microsoft patent families, however, are in fact not essential to the Standard.

39. Moreover, the two remaining patent families that arguably are essential relate to aspects of the Standard that are peripheral to the normal use of the Standard, and relate to 802.11 technology that has not been widely adopted in actual commercial use.

40. Neither of Microsoft's patents arguably essential to the 802.11 Standard is used in any Motorola 802.11-compliant product.

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41. At least because the Motorola 802.11 essential patent portfolio includes numerous patents directed to core features of the 802.11 Standard that are necessarily used by companies desiring to comply with the Standard, while Microsoft's portfolio is directed to optional non-core features, Motorola's portfolio is significantly more valuable, as a technical matter, than Microsoft's portfolio.

C. Third-Party Patents

42. A third-party patent declared by its patent owner to be essential to the 802.11 Standard cannot be assumed to be, in fact, essential to the Standard. No quality control process or analysis is generally performed on patents declared essential. The IEEE does not analyze or certify whether a declared essential patent is, in fact, essential. Further, patents are often declared essential to the Standard before the technology to be included in the Standard is finalized.

43. Prior to this lawsuit, Microsoft had declared four patents to be essential to the 802.11 Standard in letters of assurance to the IEEE. Only one of these patents is included among the above-mentioned six patent families that Microsoft now alleges to be essential to the Standard. This patent is one of the above-mentioned four patent families that, notwithstanding Microsoft's assertion of essentiality, are in fact not essential to the 802.11 Standard.

D. The 802.11 Standard

1. History

44. The 802.11 Standard was developed by the Institute of Electrical and Electronics Engineers ("IEEE"), which is a non-profit professional association with more than 400,000 members in over 160 countries with a mandate to advance technological innovation and excellence.

45. Different standards are created and promulgated by committees of the IEEE. The IEEE 802 committee was created in 1980 to develop standards for what was then a newly emerging technology: Local Area Networks (LANs). A LAN is used to enable two or more computers to communicate with (send data to) each other.

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46. Wireless networks, or wireless LANs ("WLANs"), use radio waves rather than wires to transmit data. WLANs presented several engineering challenges not present in wired LANs. For example, transmitting information wirelessly is not as reliable as using wires, and is more vulnerable to eavesdropping by unauthorized third-parties.

47. The IEEE decided in 1991 that a wireless communications infrastructure standard was necessary to meet the growing market demand for WLAN access. To create a WLAN standard, the IEEE established a working group called "IEEE 802.11." The 802.11 working group's main role was developing technical specifications for WLAN implementation.

48. The IEEE 802.11 working group issued its first standard, "IEEE 802.11," in 1997 (referred to as 802.11-1997). Subsequently, the 802.11 working group issued various amendments to the original standard including amendments for higher speeds (802.11a, 802.11b, and 802.11g), improved security (802.11i), quality of service (QoS) (802.11e), higher throughput (802.11n), and other areas.

49. Periodically, the various 802.11 amendments were rolled into consolidated standards. There have been the following consolidations: (a) IEEE 802.11, (b) 1999 Edition (R2003) (in 2003), (c) IEEE 802.11-2007 (in 2007), and (d) IEEE 802.11-2012 (in 2012).

50. The communication protocols for 802.11 have evolved since the Standard's first adoption in 1997. Each protocol is capable of certain data rates. In 1999, the "802.11a" and "802.11b" protocols were approved. 802.11a devices can communicate at data rates up to 54 megabits/sec. 802.11b is slower (11 megabits/sec), but has a greater range than 802.11a.

51. In 2003, the "802.11g" protocol was approved, which had the range of 802.11b and the data rate of 802.11a (54 megabits/sec). The 802.11 Standard requires that 802.11g devices be backwards compatible with 802.11b devices. Thus, if an 802.11b device is present on a network, the network must operate using the 802.11b protocol. Similarly, if operating conditions require, a network with 802.11g devices will fall back to 802.11b operation even if all the participants are capable of 802.11g operation.

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52. In 2009, the "802.11n" protocol was approved. It specifies new technology including, for example, the use of multiple antennas and data streams, to increase the transmitted data rate up to 600 megabits/sec. The 802.11n amendment to the Standard requires backward compatibility with 802.11b, and 802.11g.

E. The OSI Protocol

53. The 802.11 Wi-Fi Standard functions in the context of a data communications model called the Open Systems Interconnection ("OSI") model for communication protocols. Communication protocols are the rules and procedures used by communication units that communicate in a communication system. The OSI Model includes seven layers (i.e., application, presentation, session, transport, network, link, and physical layers).

54. In general, at the transmitting end, each OSI layer receives data from a "higher layer" above it, processes that data, and then passes it to the next lower layer for further processing by that layer.

55. The lowest layer, Layer 1 or the "Physical Layer," is the layer that is responsible for the actual transmission (by a transmitter) and reception (by a receiver) of the information. At the receiving end, the OSI process is applied in reverse. Each layer "receives" the information from the layer below it, processes it and passes the data to the next layer above for further processing.

56. The 802.11 Standard operates within OSI Layers 1 and 2 – the Physical Layer and the Data Link Layer.

F. The Relative Technical Value of Different Portions of the 802.11 Standard

57. When considering the relative technical importance of different sections of the 802.11 standard, basic or core features are more important than auxiliary or optional features. Without the basic features of a communication network, the network cannot exist. Auxiliary features might improve the network or the user's experience with it, but the network can still operate without these features.

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58. **Basic Features.** Three basic features of an 802.11 communications network are (1) network setup, (2) channel access, and (3) transmission of information over the network.

59. Before any communication can occur in 802.11, a network connection must first be established. This is accomplished by a network setup procedure.

60. Once a network connection exists, the network's communication units then must gain access to a communication channel before they can send or receive information.

61. Further, to send and receive information over the channel, a communication unit's receiver must understand how transmitted information is formatted so that the receiver can interpret the messages it receives from a sender. In particular, it is necessary to properly synchronize and modulate signals between two communication units.

62. **Security Features.** Another important feature of 802.11 communications is security because, unlike wired communications, wireless communications can be intercepted by third-party eavesdroppers. Transmissions can be made secure by encrypting the transmitted information using a secret encryption key. In addition, however, it is important to know that a received message was actually sent by an authorized sender, rather than by an interloper masquerading as the sender. This requires an "authentication" process to enable a receiver to confirm that a received message was transmitted by the particular communication device the receiver is expecting the message from.

63. **Peripheral Features.** Some portions of the 802.11 Standard are optional and others have not yet been established in the market place, and their value to the Standard is questionable. For example, "advertisement by a communication unit" of higher layer services was added to 802.11 in 2011, but the extent to which this will be implemented, if at all, is speculative at best.

V. MOTOROLA'S 802.11 PATENTS

64. [redacted]

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[redacted]

A. Patents Relating to Network Setup and Channel Access Management[2]

1. U.S. Patent No. 6,069,896 (Borgstahl) and U.S. Patent No. 6,331,972 (Harris)

65. **The Patents.** The '896 and '972 patents disclose a system for establishing a network connection between two wireless devices without the need for substantial user interaction or setup. Instead of requiring that a device specifically identify the other device with which it will attempt to connect, the connecting device broadcasts an unsolicited request for other devices, identifying only itself in its unsolicited message.

66. **The 802.11 Standard.** In the 802.11 Standard, a "station" is a device that wirelessly communicates in an 802.11 wireless network. An "access point" is an "infrastructure" device that may connect to another network (*e.g.*, the Internet), and also wirelessly with another station that is not itself an access point.

67. In a typical home environment, an infrastructure network includes a "router" (which includes an access point) connected to the Internet, and stations such as a computer, an Xbox, and/or a smartphone that are wirelessly connected to the access point.

68. A "beacon" is a signal broadcast by an access point, identifying (1) a unique identifier, called a "media access control" (MAC) address, of the access point that generated the beacon, and (2) the name of the network (*e.g.*, "Home_Network"), called the "SSID." Beacon signals are broadcast at regular intervals, and are independent of any request from other stations. By listening for beacon signals, a station can determine which wireless networks are within its locale.

[2] Among this group of patents is a family represented by Reardon U.S. Patent 5,636,223 ("the '223 patent"), entitled "Methods of Adaptive Channel Access Attempts." On August 24, 2012, the International Trade Commission confirmed a decision by an ALJ construing claims of the '533 patent so as not to cover the 802.11 Standard, and holding those claims invalid. The Reardon patent family is not discussed in these Findings.

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69. A "probe request" is a signal broadcast by a station that wishes to connect to an access point having a particular SSID. A probe request includes the MAC address of the sender station and the network's SSID, but not the MAC address of an access point.

70. A "probe response" signal is sent by an access point in response to receipt of a probe request. The probe response includes the MAC address of the access point and the SSID, and the capabilities of the access point. If the capabilities of the access point are consistent with those required by the station that sent the probe request, the access point and the station can proceed further. If the capabilities are insufficient, the process is terminated.

71. **Essential Patents.** The claimed inventions of the '896 and '972 patents are "essential," as that term is used by the 802.11 Standard, to the network setup process described above, which is used by all versions of the Standard. At least one claim of each patent covers the set up process described by the 802.11 Standard, and so devices complying with the Standard – including Microsoft's Xbox – would infringe those claims. [Exhibits 3296, 3297]

72. **Importance To The Standard.** The inventions claimed by the '896 and '972 patents are important to the 802.11 Standard, because the network setup procedure is a critical part of the Standard. Before any communication can occur within an 802.11 network, a station must go through the 802.11 network setup procedure. Thus, every time a computer, an Xbox, or a smartphone connects wirelessly to an access point, the 802.11 network set up process – and the inventions claimed by the '896 and '972 patents – must be used.

73. As noted in the 802.11 Standard, "The purpose of this standard is to provide wireless connectivity to automatic machinery, equipment, or [stations] that require rapid deployment, which may be portable or hand-held, or which may be mounted on moving vehicles within a local area." Without a connection between devices, the 802.11 Standard has no purpose.

74. **No Alternatives.** Microsoft asserts that, instead of a station sending to an access point an unsolicited probe request containing the identity of the sending station, it was an alternative to send the station's identity only in response to a beacon signal. This was not an

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acceptable alternative, however, as it would preclude the use of active scanning and hidden access points, and require a rewrite of the Standard to include additional messages. The AT&T GIS WaveLAN Article, also relied on by Microsoft, has the same deficiencies.

2. U.S. Patent No. 5,142,533 (Crisler)

75. **The Patent.** The '533 patent discloses a method of controlling the timing of access to a communication resource shared by multiple communication units. When multiple communication units attempt to transmit messages on a shared communication medium (such as a wireless medium) at the same time, the messages will collide and none of the messages will be properly received by the target communication units. If, immediately after this collision, all of the communication units again attempt to access the wireless medium by transmitting their messages, another collision will occur.

76. To solve this problem, the '533 patent discloses that a communication unit wanting to transmit information first senses the wireless medium to determine if another communication unit intends to use the communication resource (in the terminology of the '533 patent, when a communication unit is using the communication resource, this creates an "inhibit condition" for other units). If another unit does intend to use the resource, the communication unit determines the time period during which the other communication unit will use the communication resource (*i.e.*, when the inhibit condition will occur). The communication unit also determines the time when it desires to access the shared communication resource to transmit its signal. The communication unit will then attempt to access the shared communication resource at a time that depends on when the inhibit condition occurs and the time when access to the communication resource is desired.

77. **The 802.11 Standard.** The basic channel access method used by the 802.11 Standard is called "distributed coordination function" (DCF), which uses a technique called "carrier sense multiple access with collision avoidance" (CSMA/CA). In CSMA/CA, when a station wants to transmit, it first senses the wireless medium to determine if another station is

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using the wireless medium. If the wireless medium is not being used, the station transmits. But if the medium is being used, the stations performs a "backoff" procedure.

78. In the backoff procedure, the station selects a random "backoff time" that is decremented only during periods when the wireless medium is not being used by other stations. When the backoff timer reaches 0, the station will again check whether the wireless medium is available for use, repeating the backoff procedure if necessary.

79. A station checks whether the wireless medium is being used by another station by sensing the wireless medium to determine whether a message is being transmitted. If a message is being transmitted, the station may extract duration information from a duration field that accompanies the transmitted data in a "header." The duration information indicates how long the sending unit needs to use the wireless medium for the transmission.

80. In addition, when communicating time-sensitive information, enhanced distributed channel access (EDCA) is used by the 802.11 Standard. This is called a "quality of service" (QoS) network configuration. It is used, for example, for streaming video and "voice over IP" (VoIP – e.g., internet phone calls), which could cause video or audio degradation if data is delayed in transmission. To minimize delays in streaming such time-sensitive data, EDCA transmits the data with greater priority than lower priority data, such as an email, which can be transmitted over an extended period of time and still be received coherently by the receiver.

81. In EDCA, each message transmitted from a station is assigned a user priority. Data transmission in EDCA is similar to DCF, except that a backoff procedure is used only when a message of equal or higher user priority is being transmitted, and the backoff time is selected based in part on the user priority of the data to be transmitted.

82. **Essential Patent.** The invention claimed by the '533 patent is essential to both DCF and EDCA. At least one claim of the patent covers DCF and EDCA as described by the 802.11 Standard, and so devices complying with the Standard – including Microsoft's Xbox– would infringe this claim. [Exhibit 3308]

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83. **Importance To The Standard.** The claimed subject matter of the '533 patent is important to the 802.11 Standard. DCF is the main process by which access to the wireless medium is obtained by 802.11-compliant stations. EDCA is the main process by which access to the wireless medium is obtained by quality of service (QoS) devices (*i.e.*, devices that prioritize data transmission based on its time-sensitive nature). By using DCF and/or EDCA, channel access protocols that take into account both when a station desires to access the wireless medium and when inhibit conditions occur, an 802.11-compliant system can more fairly allocate network resources among multiple devices.

84. **No Alternatives.** Microsoft asserts that WaveLAN is an acceptable alternative to DCF and EDCA. It is not. The WaveLAN system uses a modified CSMA/CA system based on the channel access mechanism use in the 802.3 Ethernet Standard. Using this modified approach, a WaveLAN device will not attempt to resend data that was not properly received, which is deficient because a receiving device may not receive all the transmitted information. In 802.11, on the other hand, a device will attempt to retransmit data that was not properly received.

85. Microsoft also relies on the 802.3 Ethernet standard, but this does not disclose an acceptable alternative because it uses collision detection, which is not suitable for use in a wireless system such as 802.11, which uses collision avoidance. Collision detection requires a device to be able to transmit data while listening for messages from other devices. This functionality is both difficult and expensive to implement in wireless devices, and is not suitable for 802.11.

86. None of the schemes mentioned in Kleinrock et al., "Packet Switching in Radio Channels," also relied on by Microsoft, are suitable alternatives to the EDCA technology of the '533 patent used by the 802.11 Standard, at least because none provide a solution to the problem being solved by the addition of EDCA (i.e., the problem of prioritizing the sending of time-sensitive data). Further, the schemes in Kleinrock have not been shown to be as efficient as DCF, and nothing in the paper suggest they are.

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87. Likewise, 802.11 PCF, relied on by Microsoft, is not a suitable alternative to EDCA because it does not take into account whether data that is being transmitted is time sensitive. PCF is also rarely implemented in 802.11-compliant devices and has not been shown to be a suitable alternative to DCF.

88. The Aloha network, also relied on by Microsoft, has not been shown to have similar or better performance characteristics to DCF.

3. U.S. Patent No. 6,404,772 (Beach)

89. **The Patent.** The '772 patent discloses an access point for use in a mixed traffic (*i.e.*, different types of data) wireless local area network that includes a plurality of remote terminals that are associated with the access point. The access point implements a protocol that prioritizes delivery to remote stations of voice data packets over other types of data, taking into account the number of packets delivered to each station.

90. **The 802.11 Standard.** As discussed above (FF 52-53), the use of EDCA allows a device to prioritize the sending of different types of information. This is known as a "quality of service" (QoS) protocol. In EDCA, voice data is transmitted before other types of data.

91. **Essential Patent.** The invention claimed by the '772 patent is essential to EDCA as used in the 802.11 Standard. At least one claim of the patent covers EDCA as described by the 802.11 Standard for access points. Devices that provide access point functionality, with EDCA features that comply with the Standard, would infringe this claim. [Exhibit 3305]

92. **Importance To The Standard.** The claimed subject matter of the '772 patent is an important aspect of the EDCA QoS access method of the 802.11 Standard. The rise of real-time communications over wireless networks, such as video and voice over internet protocol (VoIP), necessitates the use of features recited in the claims of the '772 patent to prioritize voice data over other types of data for transmission.

93. **No Alternatives.** Microsoft asserts that a protocol known as RTP/RTCP is a suitable alternative to the EDCA quality of service mechanism of the 802.11 Standard. It is not. RTP/RTCP and 802.11 are implemented in completely different layers in the OSI protocol.

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RTP/RTCP is implemented at or above Layer 4, whereas QoS in the 802.11 Standard is located in Layer 2, below the Layer 4 of the OSI protocol. RTP/RTCP is not a QoS protocol like EDCA, but merely plays a role in setting up connections, and relies upon lower layer services – such as EDCA – to implement QoS functionality.

94. Microsoft also relies on the ITU ATM protocol, designed for wired telephone networks, but this also is not a suitable alternative to EDCA. ITU ATM assigns to each device a time slot during which the device can transmit. This results in a very inefficient system, because the communications medium can be unused if a device has no data to transmit during its timeslot, while other devices do have data to transmit at that time.

95. DCF (including RTS/CTS) and PCF of the 802.11 Standard, also relied on by Microsoft, are not suitable because they are the approaches that EDCA was designed to replace, and are not QoS protocols.

B. Patents Relating to Data Modulation Techniques

1. U.S. Patent No. 6,473,449 (Cafarella)

96. **The Patent.** The '449 patent discloses a method of wirelessly transmitting data using a technique known as "direct sequence spread spectrum" (DSSS) to suppress interference, and a type of modulation called "Differential Quadrature Phase Shift Keying" (DQPSK) to increase the data transmission rate.

97. **The 802.11 Standard.** After a connection has been established, data must be transmitted from a transmitter to a receiver. Data is wirelessly communicated by "modulating" the data onto a radio signal. The modulation technique used in 802.11b, and as a required fallback in 802.11g[3], is called "High Rate Direct Sequence Spread Spectrum" (HR/DSSS).

98. The 802.11 HR/DSSS modulation scheme enables multiple transmitter and receiver pairs to use the same band of frequencies without interfering with each other. A "spreading function" is applied to a signal, enabling transmitted signals to better withstand the

[3] The main data modulation technique used in 802.11g, when fallback is not required, is orthogonal frequency division multiplex, discussed below in FF 81-83.

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effects of various channel impairments, such as noise, fading and narrow-band jamming. The processed signal is modulated using DQPSK, which encodes information by shifting the phase of the signal.

99. **Essential Patents.** The invention of the '449 patent is essential to the HR/DSSS modulation scheme used in 802.11b and as a fallback in 802.11g. At least one claim of the patent covers HR/DSSS modulation as described by the 802.11 Standard. Thus, devices complying with the Standard – including Microsoft's Xbox – would infringe this claim. [Exhibit 3316].

100. **Importance To The Standard.** The technology claimed by the '449 patent is important because it is used by the HR/DSSS modulation scheme of 802.11b, and is a fallback requirement for 802.11g. Support for 802.11b also is necessary in 802.11n devices for backwards compatibility.

101. The HR/DSSS scheme, though slower than the newer 802.11n technique, can provide better service than other 802.11 communication schemes in certain circumstances. For example, HR/DSSS can work better than the faster 802.11n when there are multiple physical obstructions (*e.g.*, walls in an apartment) between two devices. For instance, in a typical home environment where an Xbox and an access point are in different rooms, better data transmission might be obtained by using HR/DSSS than by using the newer data transmission protocols of 802.11g or 802.11n.

102. **No Alternatives.** Microsoft asserts that Fazel, "Performance of CDMA/OFDM for mobile communications," describes an acceptable alternative to HR/DSSS. It does not. The DSSS approach of the '449 patent, which is part of the Standard, provides better data transfer rates in noisy environments compared to OFDM approaches like those describe in Fazel.

2. U.S. Patent No. 5,329,547 (Ling) and U.S. Patent No. 5,822,359 (Bruckert)

103. **The Patents.** The '547 and '359 patents disclose methods of synchronizing data signals communicated wirelessly. ''Synchronization is accomplished by inserting "reference

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symbols," known to both the transmitter and receiver, into data to be transmitted. The reference symbols can be organized in blocks or uniformly distributed through the information. The reference-coded stream of data symbols is then "spread" using a "spreading code" for transmission. When a signal with inserted reference symbols is received, the receiver uses the reference symbols to estimate certain characteristics of the communications channel on which the signal was received.

104. **The 802.11 Standard.** The 802.11b and 802.11g versions of the Standard use "HR/DSSS" modulation. In 802.11 HR/DSSS modulation, each packet of data is formatted with a preamble and header, which includes a preset series of synchronization bits. The formatted packet is then spread for transmission.

105. **Essential Patents.** The inventions claimed by the '547 and '359 patents are essential to the HR/DSSS modulation scheme used in the 802.11b and 802.11g versions of the 802.11 Standard. At least one claim of each patent covers HR/DSSS modulation as described by the 802.11 Standard. Thus, devices complying with the Standard – including Microsoft's Xbox – would infringe these claims. [Exhibits 3295, 3310]

106. **Importance To The Standard.** The claimed subject matter of the '547 and '359 patents is an important aspect of the HR/DSSS modulation technique as used in 802.11b and as a fallback requirement for 802.11g, which provides benefits mentioned in FF 73. The HR/DSSS spreading process widens the range of frequencies over which the signal is transmitted (wider bandwidth). The use of inserted synchronization symbols with a spreading process, as claimed in the '547 and '359 patents, allows for good synchronization in environments with various channel impairments, allowing for better data transmission than the newer 802.11n scheme can provide in such impaired environments.

107. **No Alternatives.** Microsoft asserts that pilot signals in a cellular telephone standard known as IS-95 was a viable alternative to the HR/DSSS technology specified by the 802.11b and 802.11g Standard. They were not. The pilot signals identified by Microsoft in IS-95 are sent with a beacon signal for timing synchronization. The synchronization provided by

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these beacon signals is not as good as the synchronization obtained by sending synchronization information together with the signal to be synchronized, as is done in the 802.11 Standard.

3. U.S. Patent No. 5,519,730 (Jasper)

108. **The Patent.** The '730 patent discloses a method of synchronizing wireless data signals by inserting time domain pilot reference symbols aperiodically into the transmitted information. A time domain pilot reference is data used to synchronize the timing of a signal so that a receiver is able to properly interpret received data frames.

109. **The 802.11 Standard.** The data modulation technique used in 802.11a, 802.11g and 802.11n is called "Orthogonal Frequency Division Multiplexing" (OFDM). In this scheme, data is divided up to modulate and transmit the data using a number of separate subcarrier frequencies at the same time.

110. In so-called single carrier systems, a single symbol (a set number of bits of data) is transmitted at a point in time. In OFDM systems, multiple symbols are transmitted at a point in time with each symbol occupying only a portion of the allocated bandwidth (i.e. a subcarrier).

111. In 802.11, the transmitted OFDM signal has 52 modulated subcarriers (48 for data, and 4 pilot subcarriers for use as a synchronization reference). Training sequences of bits are sent aperiodically with the 48 data subcarriers to provide synchronization.

112. **Essential Patent**. The '730 patent is essential to the OFDM modulation scheme used in the 802.11a, 802.11g, and 802.11n versions of the Standard. At least one claim of the patent covers OFDM modulation as described by the 802.11 Standard, and so devices complying with the Standard – including Microsoft's Xbox – would infringe this claim. [Exhibit 3293].

113. **Importance To The Standard.** The claimed subject matter of the '730 patent is an important aspect of OFDM as used in the 802.11 Standard. OFDM provides good transmission capabilities. The use of aperiodic training sequences in the subcarriers allows for fine synchronization of signals, thus increasing data transmission.

114. **No Alternatives.** Microsoft asserts that Cimini et. al., "Analysis and Simulation of a Digital Mobile Channel Using Orthogonal Frequency Division Multiplexing," discloses an

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acceptable alternative to the OFDM modulation scheme of the 802.11 Standard. It does not. Cimini discloses a narrowband system, not a wideband system like in the 802.11 Standard, and thus has a lower data transmission rate and is more susceptible to jamming and interference.

4. U.S. Patent No. 5,272,724 (Solomon)

115. **The Patent.** The '724 patent discloses a method of synchronizing the timing of a wideband data signal. A synchronization signal of the wideband data signal is divided into at least two "narrowband" synchronization signals, which are at different frequencies and each of which takes up less of the frequency spectrum than the full wideband signal. The narrowband synchronization signals are summed together before being transmitted.

116. **The 802.11 Standard.** As discussed above in connection with the '730 patent (FF 83), the transmitted OFDM signal of the 802.11 Standard has 52 modulated subcarriers transmitted at different frequencies. Before these signals are transmitted, they are summed together to be sent over a single channel.

117. **Essential Patent.** The claimed invention of the '724 patent is essential to the OFDM modulation scheme used in 802.11a, 802.11g and 802.11n. At least one claim of the patent covers OFDM modulation as described by the 802.11 Standard, and so devices complying with the Standard – including Microsoft's Xbox – would infringe this claim. [Exhibit 3309]

118. **Importance To The Standard.** The claimed subject matter of the '724 patent is an important aspect of OFDM as used by the 802.11 Standard. OFDM provides good transmission capabilities. The use of synchronization signals on different sub-carrier frequencies improves synchronization.

119. **No Alternatives.** Microsoft asserts that the Cimini article discloses an alternative to the OFDM modulation scheme of the 802.11 Standard. The alleged alternative is not acceptable at least for the reasons discussed above for the '730 patent (*see* FF 86). Gibson, "Principles of Digital and Analog Communications," also pointed to by Microsoft, likewise does not disclose an acceptable alternative. Gibson discloses little detail about claimed information synchronization subject matter of the '730 patent.

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5. U.S. Patent No. 6,038,263 (Kotzin)

120. **The Patent.** The '263 patent discloses a method of transmitting signals in a communication system by generating "pilot" channels using different "orthogonal" codes. The "orthogonal" codes modify information transmitted in different channels so the information in each channel does not interfere with each other. The pilot channels are used to synchronize a receiving to station to in order to correctly receive information. The pilot channels are transmitted to a mobile station by two or more spatially separated antennas.

121. **The 802.11 Standard.** The 802.11n amendment to the Standard added several features that significantly increased the maximum transmission data rate in a wireless network, resulting in a High Throughput (HT) mode. One such 802.11n feature is called "multiple input multiple output" (MIMO), which involves the use of multiple (up to four) antennas for transmission and receipt of data on multiple (up to four) streams.

122. **Essential Patent.** The claimed invention of the '263 patent is essential to the optional use in the 802.11n version of the Standard of the multiple input multiple output (MIMO) technique using multiple antennas. At least one claim of the patent covers MIMO as described by the 802.11 Standard, and so devices practicing MIMO as implemented in the 802.11 standard would infringe this claim. Microsoft's Xbox External Wireless-N Adapter, for example, infringes this claim. [Exhibit 3306]

123. **Importance To The Standard.** The high throughput features of the '263 patent are a necessary component of operation in 802.11n. Channel orthogonality improves throughput by allowing communication on more than one stream, each stream transmitted on a separate antenna. As services such as video streaming and video conferencing through the Xbox and computers become more data intensive, the HT mode of 802.11n is becoming more important in conventional use.

124. **No Alternatives.** Microsoft asserts that Wittneben, "Base Station Modulation Diversity for Digital SIMULCAST" is an acceptable alternative to the HT mode of 802.11n, because it discloses a simulcast system. But Wittneben's scheme cannot achieve the same data

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rates as can HT in 802.11n. Nor does Wittneben, "A New Bandwidth Efficient Transmit Antenna Modulation Diversity Scheme for Linear Digital Modulation," also relied on by Microsoft, disclose an acceptable alternative because it does not disclose orthogonal codes, and thus multiple independent streams cannot be implemented effectively.

C. Patents Relating to Security and Encryption — 802.11i[4]

1. U.S. Patent No. 5,357,571 (Banwart)

125. **The Patent.** The '571 patent discloses a method for generating encryption keys for encrypting data. The '571 patent provides that one communication device can generate a new encryption key by receiving an "identity" of a stored key (*e.g.*, an index number or label corresponding to one of a set of pre-stored keys), and other information, from another communication device. Since devices have the same pre-stored keys, the devices can authenticate each other as being allowed to communicate with each other.

126. **The 802.11 Standard.** In the 802.11 Standard, a cryptographic security scheme masks or changes (encrypts) data before it is transmitted so that an unauthorized third-party cannot see or understand the data. Typically, a secret "encryption key" is used to create a sequence of bits called an "encryption mask," which is combined with the unencrypted ("clear text") data to generate encrypted data that can only be decrypted if the recipient knows the encryption key.

127. In the 802.11 Standard, several different levels of security – including "no security" – can be selected by a user. To maintain 802.11 compatibility, a device must be capable of operating at all of these security levels. The encryption technique originally used by 802.11 was Wired Equivalent Privacy (WEP). WEP suffered from several serious drawbacks, and was superseded by encryption strategies known as Wi-Fi Protected Access (WPA) and

[4] Among this group of patents is a family represented by Finkelstein Patent 5,319,712 ("the '712 patent"), entitled "Method and Apparatus for Providing Cryptographic Protection of a Data Stream in a Communication System." The '712 patent was involved in an investigation by the ITC in connection with Microsoft's Xbox 360S products (ITC Investigation No. 337-TA-752). In the ITC Investigation, the '712 patent was adjudged to be not infringed by a device practicing the 802.11 Standard based on a claim construction adopted by the ALJ. The Finkelstein patent family is not discussed in these Findings.

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WPA2. WPA is an interim standard based on a mid-2003 draft of the IEEE 802.11i standard. WPA2 is based on the final standardized version of IEEE 802.11i, dating to 2004.

128. WPA uses an encryption scheme called "Temporal Key Integrity Protocol" (TKIP). WPA2 uses an encryption scheme called "Counter Mode with Cipher Block Chaining Message Authentication Code Protocol" (CCMP). TKIP uses existing WEP client hardware, requiring changes only to software and firmware, and thus WEP-enabled clients can be upgraded to use TKIP through a simple software/firmware update. CCMP, however, requires different hardware, and thus cannot be implemented through a software upgrade to a WEP-enabled client.

129. Encryption keys are generated by both TKIP and CCMP during the initial connection (setup) process. A distinction between TKIP and CCMP, versus WEP, is that the former prevent re-use of any keys by automatically generating new keys as needed from a "session key."

130. Although different encryption algorithms are used, both TKIP and CCMP use the same procedure, known as the "4-way handshake," to generate the encryption keys to be used in their respective encryption algorithms. The 4-way handshake involves an exchange of messages between an access point and a connecting station, which messages contain random numbers and device address information that are used to generate a unique encryption key. The 4-way handshake also allows a station and access point to authenticate each other.

131. **Essential Patent.** The claimed invention of the '571 patent is essential to the four-way handshake process used in the TKIP and CCMP encryption methods of the 802.11 Standard. At least one claim of the patent covers the 4-way handshake as described by the 802.11 Standard, and so devices complying with the Standard – including the Xbox – would infringe this claim. [Exhibit 3311]

132. The '571 patent was the subject of an investigation by the ITC in connection with Microsoft's Xbox 360S products (ITC Investigation No. 337-TA-752). The ALJ in that case determined that use by the Xbox 360S products of the 802.11 Standard's TKIP and CCMP encryption protocols infringed claims 12 and 13 of the '571 patent, and that those claims are not

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invalid. While the ITC has not yet entered a final determination in that matter, Microsoft has not sought review by the full Commission of the ALJ's determination that the use of TKIP and CCMP of the 802.11 Standard requires practicing the '571 patent.

133. **Importance To The Standard.** The technology claimed by the '571 patent is important to the 802.11 Standard, because the encryption procedure used by an 802.11-compliant network prevents a third party interloper from listening in on data transmissions. Information transmitted in wireless communication systems is extremely vulnerable to unauthorized eavesdropping, since information is communicated over the air and not confined to physical wires. By repeatedly changing the encryption key, the 802.11 Standard provides more secure communication. Further, the lack of user involvement in the process decreases the burden on the user.

134. The 4-way handshake is used with both CCMP and TKIP, the two most secure protocols in 802.11, and is important to provide the security benefits of 802.11.

135. **No Alternatives.** Microsoft asserts that the Xbox includes its own end-to-end encryption capabilities, and so the additional encryption features of the 802.11 Standard are not needed. However, the inherent security features of the Xbox do not lessen the need in the Xbox for 802.11 security, nor for the Motorola patents essential to that security. If a Wi-Fi access point is set for a given level of security by a user, then an Xbox must be able to implement that same security level to be able to communicate wirelessly with the access point. Moreover, even with its built-in security, the Xbox still sends some data in the clear unless 802.11 security is enabled. Further, no security scheme is perfect, and additional layers of security always add value to a system.

136. Microsoft also asserts that "New Directions in Cryptography," by Whitfield Diffie and Martin Hellman, discloses an acceptable alternative to the 802.11 Standard's 4-way handshake. It does not, because it does not teach the 4-way handshake's user authentication feature (*i.e.*, during the 4-way handshake, information known to each party to the communication is encoded and exchanged, decoded upon receipt, and compared to the original information, the

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result of which authenticates the parties if the decoded information matches the original information).

137. Microsoft also relies on a Challenge-Handshake Authentication Protocol (CHAP), which is a protocol used to validate the identity of devices. However, CHAP does not teach how to generate a new encryption key, which is required by the '571 patent and used in the 802.11 Standard's 4-way handshake.

138. GSM security, which Microsoft also relies on, is not an acceptable alternative because it is directed to the physical layer. The 802.11 Standard performs encryption in the data link layer, which allows for retransmission of packets without re-encrypting the data. Encryption in the physical layer does not allow this.

2. U.S. Patent No. 5,467,398 (Pierce)

139. **The Patent**. The '398 patent discloses a method for encrypting an authentication message using an encryption key, called a "messaging key," that is associated with a unique address of the transmitting communication unit.

140. **The 802.11 Standard.** In the 802.11 TKIP and CCMP encryption schemes, each message is transmitted with a "message integrity code" (MIC). The MIC code allows a receiver to know that the message was sent by the particular transmitter rather than by an unauthorized transmitter. Before transmission, the MIC code is encrypted using packet sequence numbers associated with the respective messages, and a temporal key that is generated from the unique MAC address of the transmitting station. The unique MAC address of the transmitting station is transmitted together with the encrypted MIC in each message.

141. **Essential Patent.** The technology claimed by the '398 patent is essential to the message authentication provisions of the TKIP and CCMP encryption methods of the 802.11 Standard. At least one claim of the patent covers the encryption and transmission of the MIC code in both the TKIP and CCMP security schemes as described by the 802.11 Standard, and so devices complying with the Standard – including the Xbox – would infringe this claim. [Exhibit 3313]

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142. **Importance To The Patent.** Message authentication is necessary to the 802.11 Standard to prevent interlopers from listening in on a wireless communication. By encrypting an authentication message with a key associated with the address of the transmitting device, as in the '398 patent and as is done in TKIP and CCMP, there is less likelihood that an interloper will be able to interfere with communications, by, for example, substituting his own message into the wireless medium in place of a real one.

143. **No Alternatives.** Microsoft asserts that not using a temporal key, which is associated with the MAC address of the transmitter, is an acceptable alternative to the technology of the '398 patent and the 802.11 Standard. It is not. Using a different key than the temporal key would require additional steps and overhead. Microsoft also asserts that not using the MAC address of a station in the encryption of the MIC code is an alternative, but this approach does not avoid the '398 patent because a MAC address is still sent with the message, and thus associated with the key used to encrypt the MIC code.

3. U.S. Patent No. 5,689,563 (Brown)

144. The '563 patent discloses a method of secure messaging in a communication system using "instant specific" information that is maintained by communication units in the system. Examples of instant-specific information disclosed in the '563 patent include, *e.g.*, the time of day, a radio port number, and a time slot number. The communication unit uses the instant specific information to generate an authentication message. The authentication message is then sent to another communication unit, which uses the authentication message to authenticate the sender.

145. **The 802.11 Standard.** In both TKIP and CCMP encryption schemes, each packet is transmitted with a unique packet sequence number, and the message integrity code (MIC) in a packet is encrypted using the packet sequence number. Thus, the encryption mask used to encrypt the MIC code is different for each packet based on instant-specific information.

146. **Essential Patent.** The technology claimed by the '563 patent is essential to the message authentication provisions of the TKIP and CCMP security methods of the 802.11

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Standard. At least one claim of the patent covers the encryption and transmission of the MIC code in both TKIP and CCMP as described by the 802.11 Standard, and so devices complying with the Standard – including the Xbox – would infringe this claim. [Exhibit 3294]

147. **Importance To The Standard.** The '563 patent is important to the 802.11 Standard. Message authentication is necessary to prevent interlopers in secure systems. By using an instant-specific variable in the creation of an authentication message, the '563 encryption method makes it more difficult for an interloper to impersonate a station in an 802.11 network. This mechanism is used with both TKIP and CCMP, the strongest forms of 802.11 security.

148. **No Alternatives.** Microsoft asserts that not using a temporal key in generating the MIC code is an acceptable alternative to the technology of the '398 patent and the 802.11 Standard. It is not. Using a different key than the temporal key would require additional steps and overhead. Microsoft also asserts that the use of the message data itself to encrypt the MIC would be an alternative, but the message data itself is instant specific information, and thus this approach would not avoid the '563 patent.

4. U.S. Patent No. 5,412,722 (Sherly)

149. **The Patent.** The '722 patent discloses a method of group rekeying in a secure communication environment. "Rekeying" is a process by which a new encryption key is distributed to devices in a network. A central key management controller used to manage rekeying sends out information about when the rekeying will occur, together with the necessary variables required to generate a new key. When the time to rekey arrives, a group of communication units perform the rekeying.

150. **The 802.11 Standard.** In 802.11, a "group key handshake" is performed between two devices to generate a key for the broadcast of a message from one device to multiple other devices. During the group key handshake, the access point sends each message with a "key replay count" that is used by the receiving station to compare with and update a stored key replay count.

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151. **Essential Patent.** The technology claimed by the '722 patent is essential to the group rekeying feature of the 802.11 Standard. At least one claim of the patent covers key generation in the group key handshake as described by the 802.11 Standard, and so devices that practice the group key handshake for broadcasting in accord with the Standard would infringe this claim. [Exhibit 3312]

152. **Importance To the Standard.** The '722 patent is important to the 802.11 Standard for applications requiring broadcast of messages. The group key handshake is necessary to allow secure group communication without compromising the private key for one-on-one communication between devices.

153. **No Alternatives.** Microsoft asserts that "New Directions in Cryptography," by Whitfield Diffie and Martin Hellman, discloses an acceptable alternative to the 802.11 Standard's group key handshake. It does not, because it is used to generate a key for one-to-one communications, and not a group key for broadcasting encrypted messages to multiple devices.

154. Microsoft also relies on the Challenge-Handshake Authentication Protocol (CHAP), which is a protocol used to validate the identity of devices, but does not teach how to generate a new key, which is required by the '722 patent and used in the 802.11 Standard.

155. GSM security, which Microsoft also relies on, is unacceptable because it is directed to the physical layer. The 802.11 Standard performs encryption in the data link layer, which allows for retransmission of packets without re-encrypting the data. Encryption in the physical layer does not allow this.

D. Patents Relating To Power Management

1. U.S. Patents 5,029,183 (Tymes) and 5,479,441 (Kramer)

156. **The Patents.** The '183 and '441 patents disclose methods in which a device in a power save mode decides when it wants to receive messages from a base station by transmitting a polling signal to the base station. The base station responds with an acknowledgement (the '183 patent), or a reply signal that can (but need not) include the message to be transmitted (the '441 patent), to the device in the power save mode.

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157. **The 802.11 Standard.** The 802.11 Standard defines a power save mode. A station will enter a "doze" state during which messages at an access point destined for the station are not sent immediately, but instead are stored (buffered) at the access point until the station wakes up.

158. When in the doze state, a station's antenna cannot receive messages from other wireless devices (such as an access point). Instead, the station wakes up at regular intervals to listen for "delivery traffic information messages" (DTIMs) transmitted by the access point. DTIM messages indicate the stations for which the access point is buffering messages.

159. If a DTIM message indicates that the access point has a buffered message for a particular station, the station will send a polling message to the access point requesting the access point to send the message to the station. The access point will only send messages to the station upon receipt of such a polling message. Thus, when a station is in its power saving (doze) mode, the access point cannot initiate data communications with the station.

160. **Essential Patents.** The claimed inventions of the '183 and '441 patents are essential to the power saving features of the 802.11 Standard. At least one claim of each patent covers the 802.11 Standard's power saving mode, and so devices implementing the 802.11 power save mode – such as battery-powered mobile devices – would infringe this claim. [Exhibits 3307, 3315]

161. The '183 and '441 patents were involved in litigation between Symbol Technologies, Inc. and Proxim, Inc. in the District of Delaware (01-cv-00801-SLR). A September 2003 jury verdict found that Proxim infringed claims 1, 16, 21, 35, 40, and 41 of the '183 patent and claims 1, 6, 7, and 12 of the '441 patent by the sale of products that were interoperable with the 802.11 Standard, and implemented the claimed power management features.

162. **Importance To The Standard.** The inventions of the '183 and '441 patents are important to the 802.11 Standard, particularly for battery-powered devices that include Wi-Fi functionality. All wireless devices face power management strains when they are required to

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keep their Wi-Fi transceiver systems powered at all times. Mobile wireless devices face further limitations due to their limited battery capacity. It is therefore important to minimize the power required for such devices to participate in wireless network communications. The power-management techniques claimed in the '183 and '441 patents, and implemented by the 802.11 Standard, provide an important mechanism for wireless devices to meet these needs.

163. **No Alternatives.** Microsoft asserts that the power saving technique described in U.S. Patent 5,440,560 ("the '560 patent") is an alternative to the power saving feature of the 802.11 Standard. It is not. It has not been shown that the power saving benefits of the '560 patent outweigh its overhead costs, or that the '560 patent has ever been practiced in an actual application.

164. Microsoft also relies on another power saving mechanism of the 802.11 Standard (at 802.11-2012 § 10.2.1.1), in which an access point responds to a station's polling signal immediately with a data signal instead of sending an acknowledgement message before sending a data signal. However, this other operation does not avoid the '441 patent, which does not recite an "acknowledgement signal" but instead recites a "reply signal." A data signal is a "reply signal" as recited by the '441 patent. Moreover, using only this asserted alternative would not properly handle a situation in which multiple stations each sends a polling signal to the access point at the same time.

2. U.S. Patent 5,560,021 (Vook)

165. **The Patent.** The '021 patent relates to power management for use in a wireless LAN, in which a communication device enters a power saving mode during which the device only periodically listens for messages and turns off its transceiver at other times.

166. **The 802.11 Standard.** An 802.11-compliant device in basic power saving mode that receives a DTIM message indicating that a message for the device is being buffered at the access point will remain in an awake state until the entire message is received.

167. **Essential Patent.** The claimed invention of the '021 patent is essential to the power saving features of the 802.11 Standard. At least one claim of the patent covers the 802.11

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Standard's power saving mode, and so devices implementing the 802.11 Standard's power save mode – such as battery-powered mobile devices – would infringe this claim. [Exhibit 3314]

168. **Importance To The Standard.** The power saving technique claimed by the '021 patent is important, particularly for portable, battery-powered devices that include Wi-Fi functionality. All wireless devices face power management strains when such devices are required to keep their Wi-Fi transceiver systems powered at all times. Mobile wireless devices face further limitations due to their limited battery capacity. It is therefore important to minimize the power required for such devices to participate in wireless network communications. Further, the '021 patent's invention used by the Standard enables 802.11-compliant devices to avoid a situation where a device inadvertently misses a message transmitted to it.

169. **No Alternatives.** Microsoft asserts that the 802.11 Standard's power saving mechanisms described in 802.11-2012 § 10.2.1.1 are acceptable alternatives to the power saving invention claimed in the '021 patent. They are not, because the '021 patent covers both those modes.

170. Alleged power saving alternatives from paging and cellular applications, also relied on by Microsoft, have fundamentally different concerns than 802.11 wireless power saving modes and have not been shown to be viable in the 802.11 Standard.

171. Nor has Microsoft shown the subject matter of U.S. Patent 5,440,560 to be a viable alternative since it has not been shown that the power saving benefits of the '560 patent outweigh its overhead costs, or that the '560 patent has ever been practiced in an actual application.

3. U.S. Patent No. 6,236,674 (Morelli)

172. **The Patent.** The '674 patent discloses methods of switching a device between a low-power consumption mode and an active mode. The device switches from low-power mode to active mode in response to receiving an indication that a message is directed towards the device, and then receives the message in the active mode.

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173. **The 802.11 Standard.** In "Dynamic Spatial Multiplexing Power Save Mode" as specified by 802.11n, a device with multiple antennas keeps one antenna awake to receive messages while other antennas are turned off. The other antennas are turned on only when a signal received by the constantly awake antenna indicates that a message is to be transmitted to the device.

174. **Essential Patent.** The '674 patent is essential to the Dynamic Spatial Multiplexing Power Save Mode in the 802.11n-2009 Standard. At least one claim of the patent covers the power saving mode as described by the 802.11 Standard, and so 802.11n-compatible devices with multiple antennas would infringe this claim. [Exhibit 3303]

175. **Importance To The Standard.** The '674 patent is important to the 802.11 Standard because, as discussed above in FF 134, power management is essential for minimizing power consumption, and can be especially useful in applications that are limited by battery capacity.

176. **No Alternatives.** Microsoft relies on the Static Spatial Multiplexing (SM) Power Save Mode of the 802.11n standard as an alternative to Dynamic Spatial Multiplexing Power Save Mode in 802.11n. It is not. SM Power Save Mode has lower performance since only one antenna and receiver chain can be used.

177. Nor has the subject matter of US Patent 5,440,560, also relied on by Microsoft, been shown to be a viable alternative. It has not been shown that the power saving benefits of the '560 patent outweigh its overhead costs, or that the '560 patent has ever been practiced in an actual application.

E. Patents Relating to Low Density Parity Check Codes – U.S. Patent No. 7,143,333 (Blankenship), U.S. Patent No. 7,165,205 (Blankenship), and U.S. Patent No. 7,493,548 (Nimbalker)

178. **The Patents**. The '333, '205 and '548 patents relate to encoding and decoding data using low-density parity-check ("LDPC") codes. LDPC codes are used by communicating devices to detect and correct wireless transmission errors in a received message.

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179. **The 802.11 Standard.** Wireless transmission of data is prone to data errors occurring during transmission due to interference and other factors. If an error occurs in transmission, the received data will be incorrect. Error correction codes such as LDPC codes are specified by the Standard to address this problem. The LDPC technique involves the use of a "parity check matrix" with a particular structure that allows for very efficient error correction.

180. **Essential Patents.** The '333, '205 and '548 patents are essential to the use of LDPC codes as described in the 802.11n-2009 amendment. At least one claim of each of the patents covers the use of LDPC codes as described by the 802.11n amendment, and so devices that use the Standard's LDPC codes would infringe these claims. [Exhibits 3299, 3302, 3304]

181. **Importance To The Standard.** The technologies claimed by the '333, '205 and '548 patents are important to the 802.11 Standard because the use of LPDC codes leads to efficient encoding for data transmission without compromising performance. LDPC codes have reached widespread adoption in other uses. For example, LDPC codes have replaced so-called "turbo codes" in the DVB-S2 standard for satellite transmission, and have replaced "convolutional turbo" codes in the ITU-T G.hn standard for home networks. In addition, LDPC codes are a mandatory part of the present draft version 9.0 of the 802.11ad amendment, based on the Wireless Gigabit Alliance Specification directed toward very high throughput. Properly structured LDPC codes as described and claimed by the '333, '205, and '548 patents are necessary to reduce decoding complexity.

182. **Alternatives.** As stated above, although the widespread use of turbo codes are an alternative to LPDC codes, the latter are a mandatory part of the present draft version 9.0 of the 802.11ad amendment, based on the Wireless Gigabit Alliance Specification directed toward very high throughput.

F. Patent Relating to Data Fragmentation – U.S. Patent No. 5,311,516 (Kuznicki)

183. **The Patent.** The '516 patent is directed towards message defragmentation in which a data packet that has been separated into fragments for easy transmission is

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reconstructed. When a received fragment indicates that no more fragments are to be received, a receiver begins reconstructing the message.

184. **The 802.11 Standard.** When defragmenting packets in 802.11, each fragment of the packet has a bit indicating to the receiving station whether the fragment is the last fragment of the packet to be received.

185. **Essential Patent.** The '516 patent is essential to the defragmentation process of the 802.11 Standard. At least one claim of the patent covers defragmentation as described by the 802.11 Standard, and so devices that defragment data in an 802.11-compliant network would infringe this claim. [Exhibit 3300]

186. **Importance To The Standard.** Fragmentation can be used in an 802.11-compliant device to split packets into smaller units suitable for transmission in noisy conditions. The desired size for transmission depends on the number of users in the system and the noise conditions of the communication channel. Longer packets require longer transmission time, and increase the time during which the wireless medium is busy. In noisy environments in which data is more susceptible to corruption during transmission, reducing packet size can increase data throughput.

187. **No Alternatives.** Microsoft relies on the Internet Protocol Version 4 (IPv4) standard as an acceptable alternative. It is not. IPv4 is directed toward the network layer 3 of the OSI model, unlike the 802.11 Standard, which is directed to the data link and physical layers (layers 1 and 2). IPv4 also requires additional overhead for transmitting additional network layer headers.

188. The use of a counter instead of a flag to detect a last fragment, also relied on by Microsoft, is not an acceptable alternative because it is more complex and resource intensive.

G. Patent Relating to Fast Transitions – 802.11r – U.S. Patent No. 7,236,477 (Emeott)

189. **The Patent.** Some networks have more than one access point to increase the size of the network. The '477 patent discloses a method of quickly transitioning a communication

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device connection from a first access point to a second access point in a secure network. A station obtains, from a first access point, a cryptographic key as well as the identity of a neighboring access point and information associated with the neighboring access point. When the station associates with a neighboring access point in the list, it derives a new key for encryption based on the previously obtained cryptographic key and the information associated with the neighboring access point.

190. **The 802.11 Standard.** The 802.11r amendment facilitates fast transitions of stations between access points by computing intermediate cryptographic keys used for the 4-way handshake prior to the transition, which decreases the number of data frames that must be exchanged and reduces computation time for key generation during transitions.

191. **Essential Patent.** The '477 patent is essential to the fast transition capability of the 802.11r version of the standard. At least one claim of the patent covers fast transitions as described by the 802.11 Standard, and so devices complying with the Standard would infringe this claim. [Exhibit 3301]

192. **Importance To The Standard.** The '477 patent's invention as used in the 802.11 Standard enables fast transitions when a station roams between access points by performing some of the steps of the 4-way handshake for TKIP and CCMP prior to the transition between access points. Performing the full 4-way handshake can consume a considerable amount of time, and could disrupt communication of data if fully performed during transition of a station between access points.

193. **No Alternatives.** Microsoft alleges that an alternative to allowing stations to participate in the decision to re-associate with a second access point, the access points could enforce a hand-off communication between neighboring access points. Microsoft provides no analysis of the trade-offs required in implementing such an alternative as compared to the 802.11 Standard.

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H. Patent Relating to Mesh Networking – 802.11s – U.S. Patent No. 7,197,016 (Belcea)

194. **The Patent.** The '016 patent discloses a "multi-hopping" radio system in a "mesh network" of wireless devices. In a mesh network, multiple radio devices form a chain such that two devices that are not within radio range of each other can still communicate by causing a message to "hop" from the transmitting device to the receiving device via the devices in between. In the '016 patent, each wireless device in the system stores registration information about other wireless devices in the system in order to keep track of the most efficient path to each device.

195. **The 802.11 Standard.** In the 802.11s amendment, a "gateway" (the interface between a wireless mesh network and an external network such as the Internet) registers all stations in the mesh network, and thus one station can communicate with all other stations in the network—even those out of radio range.

196. **Essential Patent.** The '016 patent is essential to the mesh networking provisions of the 802.11s version of the standard. At least one claim of the patent covers mesh networking as described by the 802.11 Standard, and so devices implementing mesh networking features in compliance with the Standard would infringe this claim. [Exhibit 3298]

197. **No Alternatives.** Microsoft relies on Kahn et al., "Advances in Packet Radio Technology;" 70 different protocols cited from a Wikipedia page, and U.S. Patent 5,488,608 as suitable alternatives to the mesh networking "multi-hopping" features of the 802.11 Standard. There has been no analysis of the trade-offs required in implementing such alternatives as compared to the 802.11 Standard.

I. Current Use of the Motorola 802.11 Essential Patents in Microsoft Products

198. Microsoft's support web site for the Xbox products states that the Xbox has:

> …. 802.11n Wi-Fi built in for a faster and easier connection to Xbox LIVE [an Xbox gaming and video resource on the Internet]. Download or stream HD movies, TV episodes and games from Xbox LIVE Marketplace ... from anywhere in the house. Compatible with b/g/n networks.

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199. [redacted]

200. [redacted]

201. Microsoft marketing literature confirms that the Xbox is compatible with all levels of 802.11 security, including TKIP/WPA and CCMP/WPA2.

202. [redacted]

203. User documentation for Microsoft's Xbox products specifically instructs users how to set up the Xbox for WPA and WPA2 security, and recommends that the highest available security setting be used.

204. In a typical home setting, where an Xbox product is set up to wirelessly communicate with a Wi-Fi access point, the Xbox must be set up to match the security setting of the access point to be able to communicate wirelessly.

205. Microsoft implements in the Xbox security that operates independently of the 802.11 Standard. However, it is nevertheless the case that, if an access point is set by a user for WPA or WPA2 security, then the Xbox must also be set to that level of security in order for it to communicate.

206. [redacted]

207. Survey results show that at least 32% of users of the Xbox 360 use TKIP or CCMP security when connecting to the Internet through Wi-Fi.

208. If an Xbox wirelessly communicates over the Internet without an 802.11 security setting, then transmitted Internet addresses, header information relating to the data being transmitted, and any unencrypted content are exposed to eavesdroppers, notwithstanding [redacted]

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[redacted]

209. No data security is perfect, and the use of additional layers of security in addition to what the 802.11 Standard provides can further increase the overall security provided by the system.

210. Microsoft Xbox products use at least the following 11 Motorola 802.11 essential U.S. patents: 6,331,972 (Harris); 6,069,896 (Borgstahl); 6,473,449 (Cafarella); 5,329,547 (Ling); 5,822,359 (Bruckert); 5,519,730 (Jasper); 5,272,724 (Solomon); 5,142,533 (Crisler); 5,357,571 (Banwart); 5,467,398 (Pierce); 5,689,563 (Brown).

211. The Xbox is the smallest saleable unit sold by Microsoft that provides complete 802.11 functionality.

212. [redacted]

213. [redacted]

214. [redacted]

215. [redacted]

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VI. MICROSOFT'S 802.11 PATENTS

216. Microsoft has alleged that six of its patent families are essential to the 802.11 standard: (1) Shen U.S. Patent 7,974,574 ("Shen '574"); (2) Kuehnel U.S. Patent 7,613,426 ("Kuehnel '426"); (3) Giaimo U.S. Patent 7,522,551 ("Giaimo '551"); (4) Bahl U.S. Patent 7,440,754 ("Bahl '754") and Bahl U.S. Patent 7,194,263 ("Bahl '263"); (5) Karr U.S. Patent 6,999,545 ("Karr '545"); and (6) Srinivas U.S. Patent 6,745,360 ("Srinivas 360").

217. None of these patent families is used in any Motorola products.

218. Shen '574 is alleged by Microsoft to cover the general advertising service (GAS) portion of the 802.11u amendment, intended to allow wireless mobile devices to search out services available on a network before connecting to that network. It is unlikely that an 802.11-compliant device would ever practice the '574 patent, which at most occurs in the unlikely event that a device provides access point functionality while simultaneously requesting a wireless advertisement message from another device. GAS is optional in the Standard, and the use in general of GAS in the future is purely speculative, and is likely to be limited in scope.

219. Kuehnel '426 is not essential to the 802.11 standard, at least because it requires the receipt of an advertising message as well as a separate exchange of request and reply messages (*see, e.g.*, claim 1). In 802.11, the General Advertising Service (GAS) involves only a single exchange of GAS request and reply messages, and not a second exchange as required by the '426 patent.

220. Microsoft has alleged that Giaimo '551 reads on the tunneled direct-link setup ("TDLS") technology added as part of the 802.11z amendment. TDLS allows wireless stations that are associated with an access point to establish a direct link with each other, using an exchange of frames that proceed through the access point. Giaimo '551 would at most be used when a channel switching capability is implemented. Such channel switching capability is optional in the Standard, and there is no evidence that TDLS has been adopted in Wi-Fi devices.

221. Bahl '754 and Bahl '263 are not essential to the 802.11 Standard, at least because, in the Bahl patents, the intelligence and decision for transitioning between an infrastructure mode

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and an ad hoc mode resides at the access point (see, *e.g.*, claim 11). On the other hand, in DLS in the 802.11 standard, the intelligence and decision of transitioning between the infrastructure mode and ad hoc mode resides at the station, not the access point.

222. Srinivas '360 is not essential to the 802.11 Standard at least because the preamble of '360 claim 11 recites "a method for controlling the rate of acknowledgement of packets." However, none of the applicable portions of the 802.11 Standard indicates any control of the rate of acknowledging packets.

223. Karr '545 is not essential to the 802.11 Standard, at least because, for example, '545 claim 1 requires that m separate portions with m different headers be encoded, whereas the applicable portions of the 802.11 Standard (802.11-2012 at §§ 20.3.3, 20.3.9.3.2, 20.3.9.4.2 and FIG 20-1, TBL 20-9, 20-10) involve the use of a single header for all portions of the information signal.

VII. THE H.264 STANDARD AND THE PARTIES H.264 PATENTS

224. [redacted]

225. The H.264 Standard is a video coding standard, also known as MPEG-4, Part 10 and "AVC" (Advanced Video Coding).

226. H.264 is currently the most widely used video coding format. It is used in applications ranging from mobile services to video conferencing to IPTV (Internet Protocol TV), HDTV (High Definition TV), and HD video storage.

227. A patent is deemed essential to the H.264 Standard if any of its claims is essential. An essential patent claim is a claim that is "required to implement a specific Recommendation/Deliverable [H.264]." Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC at p. 2.

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A. Motorola's Patents

228. There are 16 Motorola U.S. patents, and many foreign counterparts to those patents, that are essential to the practice of the H.264 Standard. These 16 patents are distributed among 6 patent "families." A family consists of a "parent" United States patent, together with related patents that are either United States continuations or divisionals of the parent, or foreign counterparts to one of the United States patents.

229. The 6 Motorola families of H.264 essential patents are directed to three general technological categories: (a) adaptive frame/field coding, (b) prediction, and (c) transform/quantization.

230. Microsoft states that its Xbox, Windows 7, Windows 8, Windows Vista, Zune for Windows and Expression, Windows Phone 7 and 7.5, and Windows Embedded products comply with certain Profiles/Levels of the H.264 Standard.

231. The 6 Motorola families of H.264 essential patents claim subject matter that is used in Xbox, Windows 7, Windows 8, Windows Vista, Zune for Windows and Expression, Windows Phone 7 and 7.5, and Windows Embedded products.

232. The 6 Motorola families of H.264 essential patents are directed to important core aspects of the H.264 Standard that are necessarily used by products that are compliant with the Main and High Profiles of the H.264 Standard.

233. For 2 of the Motorola families of H.264 essential patents (Krause and Wu), there are no alternative approaches to the technologies covered by the Motorola essential patents that have been shown to have been actually considered for implementation in the H.264 Standard. Nor has it been shown how any purported alternative would or could have been implemented in the Standard. Even if this could be shown, the purported alternatives would perform worse than the technologies covered by the Motorola essential patents.

234. For 4 of the Motorola families of H.264 essential patents (Eifrig, Scan, MBAFF, PAFF), the ITU/ISO/IEC Standards Organizations considered alternative approaches to the technologies covered by the Motorola essential patents for implementation in the H.264

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Standard. Motorola demonstrated that its technologies covered by the Motorola H.264 essential patents significantly improved efficiency over alternative approaches, and adopted Motorola's technologies into the Standard.

235. Exhibit 3266 is a summary chart identifying Motorola's H.264 essential patents, their patent family information, and Microsoft's products usage.

B. Microsoft's Patents

236. Microsoft owns 40 U.S. patents that it asserts are essential to the H.264 Standard.

237. At least 17 of the Microsoft patents, however, are not essential to the H.264 Standard: 15 are directed to ancillary features in the H.264 Annexes that a conforming decoder is not required to use; and at least 2 do not read on the H.264 Standard. For many of the Microsoft patents, there was comparable technology available that existed at the time of the adoption of the Standard.

238. Motorola's portfolio is as valuable or slightly more valuable, as a technical matter, than Microsoft's patent portfolio. In particular, Motorola's H.264 essential patent portfolio is directed to core features that are necessarily used by any company desiring to comply with the Main and High Profiles of the H.264 Standard. In contrast, 17 of Microsoft's patents are directed to features that are optional or non-essential to the Standard.

C. The H.264 Standard

1. History

239. The H.264 Standard was jointly developed by the International Telecommunications Union ("ITU") and the International Standards Organization ("ISO")/International Electrotechnical Commission ("IEC"). It was a collaborative effort between the ITU-T Video Coding Experts Group ("VCEG") and the ISO/IEC Moving Pictures Expert Group ("MPEG"). The working group of video coding experts was called the Joint Video Team ("JVT").

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240. The H.264 Standard was developed in response to the growing need for higher compression of moving pictures such as videoconferencing, digital storage media, television broadcasting, Internet streaming, and communication.

241. The process for developing H.264 involved regular meetings at which contributors made proposals in terms of identifying problems with the existing video compression technologies and researching and developing potential solutions. Potential amendments and solutions put forward by contributors were considered and either approved or rejected at the meetings with a view to developing and producing recommendations to create the new video coding standard.

242. Whether a technology/solution was adopted generally depended on how the proposal performed in testing and computer simulation, as well as an assessment of the quality of the visual end product that it was capable of producing.

243. Motorola's employees were actively involved in this process. Ajay Luthra was a co-chair of the JVT. In addition, Limin Wang and other Motorola inventors participated in the development of numerous proposals which were submitted to the JVT for consideration.

244. The first version of the H.264 Standard was adopted in May 2003.

245. The H.264 Standard provided approximately a 50% savings in bit rate for the same perceptual quality as compared to prior video coding standards.

2. The Relative Technical Value of Features of the H.264 Standard

246. When considering the relative importance of different sections of the H.264 Standard, basic features are more important than ancillary or optional features. Without the basic features of H.264, a decoder cannot properly decode H.264-encoded digital video content. Ancillary features might improve the user's experience with the video content, but the H.264 decoder can still operate without these features.

247. **Basic Features.** Three basic features of H.264 are adaptive frame/field coding, prediction, and transform/quantization.

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248. **Adaptive Frame/Field Coding.** The basic idea of adaptive frame/field (AFF) coding is to be able to switch between frame coding (which is typically preferred when the video scene contains limited motion) or field coding (which typically works better when there is fast picture-to-picture motion).

249. To provide high coding efficiency, H.264 includes two AFF coding techniques. In *picture adaptive frame/field* ("PAFF"), the frame coding or field coding can be adaptively selected on a picture-by-picture basis. In *macroblock adaptive frame/field coding* ("MBAFF"), the frame or field coding can be done on a more localized basis within a coded frame for each vertical pair of macroblocks (16×32 luma region).

250. **Prediction.** The basic idea of prediction is to eliminate redundancy from picture to picture in order to reduce the number of bits that need to be transmitted or stored. Broadly speaking, if we want to represent a part of a picture, we look for another part of the same picture, or a part of a different picture, that is very similar, and which we already know. Then we compute the difference between the two parts, which we call the residual, and process only that. There are two types of prediction: intra prediction and inter prediction.

251. In intra prediction, a prediction is created from spatial extrapolation of neighboring image samples from within the same picture frame. In inter prediction, blocks are predicted using blocks from different pictures, called reference pictures. Inter prediction is a way to perform motion compensation, i.e., to exploit the high correlation between successive pictures of a video stream that represents moving objects.

252. **Transform/Quantization.** The basic idea of transform is to convert pixel values into frequency coefficients. The frequency coefficients are easier to compress than the pixel values themselves. The basic idea of quantization is to reduce the number of bits required to represent each coefficient. After the frequency coefficients are quantized they are scanned. During encoding, the frequency coefficient scan scans the frequency coefficients from locations in two dimensions and repositions them in one dimension for the next coding step.

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253. **Ancillary Features.** In general, the ancillary, or optional, features of the H.264 Standard are contained in the Annexes. The ancillary features in Annexes B.3, C, D and E are optional, meaning that a conforming decoder is not required to use these features.

3. H.264 Profiles/Levels

254. The H.264 Standard specifies a number of "profiles." A profile specifies a subset of the coding tools so that a decoder conforming to that profile needs to support only the tools contained within that profile.

255. Constrained Baseline Profile: Certain elements of H.264 are mandatory for all applications and devices used in the H.264 Standard. These elements are contained in the Constrained Baseline Profile, which is a subset of every other profile. This profile is suitable for use on a standalone basis for low-cost videoconferencing and mobile telephone applications.

256. Baseline Profile: The Baseline Profile is a superset of the Constrained Baseline profile and adds three additional tools for transport efficiency.

257. Main Profile: The Main Profile is a superset of the Constrained Baseline profile and adds field coding, adaptive frame/field coding (including MBAFF and PAFF video), CABAC (context-adaptive binary arithmetic coding) entropy decoding, and bi-predicted ("B") pictures (use of up to two motion vectors per predicted block) with prediction modes such as weighted prediction. As a result, the Main Profile offers improved coding efficiency. This profile can be used for standard-definition and high-definition digital TV broadcasts. The Main Profile was originally intended as the mainstream consumer profile for broadcast and storage applications, but the High Profile is being used for those applications as well.

258. High Profile: The High Profile is a superset of the Main Profile and adds additional tools. It is the primary profile for complex broadcast and disc storage applications, particularly for high-definition television applications (for example, H.264 High Profile is supported by DVB-T2 and is one profile identified as mandatory for the Blu-ray Disc storage format).

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259. The H.264 Standard also provides for "Levels" within each Profile. A Level is a specified set of constraints imposed on values of the syntax elements in the bitstream.

260. A decoder that supports a Profile/Level must be capable of decoding a bitstream that has been encoded with the tools of that level. A decoder does not conform to a Profile/Level if it is not capable of decoding all of the possible bitstreams at that Profile/Level. The H.264 Standard states that: "Profiles and levels specify restrictions on bitstreams and hence limits on the capabilities needed to decode the bitstreams. Each profile specifies a subset of algorithmic features and limits that shall be supported by all decoders conforming to that profile. Each level specifies a set of limits on the values that may be taken by the syntax elements…"

261. For the Main and High Profiles, a decoder that conforms to Levels 2.1 to 4.1 must support interlace coding. Levels 2.1 to 4.1 include the levels that are used for standard definition ("SD") and high definition ("HD") video.

VIII. MOTOROLA'S H.264 PATENTS

A. The Krause '419 Patent Family—U.S. Patent No. 5,235,419

262. The '419 patent discloses adaptive video compression using a plurality of motion compensators, in order to more effectively encode video data in which complex movements occur.

263. The '419 patent describes an encoder that compares motion compensators using a plurality of different block sizes, and then transmits the compressed block data for the block size that results in the least amount of data and a code word indicative of the block size used. It further describes a decoder that receives the compressed block data and the code word from the encoder, and uses the code word to recover the motion vector. Having the motion vector, the block data can then be decompressed.

264. The '419 patent is "essential" to the adaptive motion compensation scheme used in the H.264 Standard at every Level of the Baseline, Main, and High Profiles. At least one claim of the '419 patent covers adaptive motion compensation as described by the H.264

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Standard, and so Microsoft's products complying with the Standard – including Microsoft's Xbox and Windows 7 – would infringe this claim. (Exhibit 3268).

265. The subject matter of the '419 patent is an important aspect of prediction as it is performed in the H.264 Standard, because it allows video encoders to encode video more efficiently by adaptively using the block size that results in the most compression of the video data. Likewise, it allows video decoders to retrieve a code word that indicates which block size the encoder used, and use that code word to recover motion vectors.

266. U.S. Patent No. 5,144,423 does not disclose an acceptable alternative. It requires more bits because motion vectors are sent for both block sizes rather than just the optimum block size, and thus would be less efficient. Nor does the Ph. D. Thesis of Dr. Gary Sullivan disclose an acceptable alternative, because it is limited to square block sizes, and thus requires coding additional motion vectors when it would be more efficient to code one motion vector for a rectangular block. Nor does CCITT SGXV document #453 disclose an acceptable alternative, because it does not use different motion compensators on the same image region where the motion compensator resulting in the most compression is selected for that region, and thus would be less efficient. Nor does Puri et al, "Interframe Coding with Variable Block-size Motion" disclose an acceptable alternative, because it does not use different block sizes for the same video data to determine the size with the best compression, and thus would be less efficient.

267. None of the alleged prior art references discloses each and every element of claim 20 of the '419 patent.

268. One of ordinary skill in the art would understand from the '419 patent specification that the structures corresponding to the claimed functions of the means-plus-function claims can be implemented in hardware or software.

B. The Wu '968 Patent Family—U.S. Patent No. 5,376,968

269. The '968 patent discloses a system that enables more effective compression of video data, by providing adaptive video compression using a plurality of compression modes.

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270. The '968 patent describes an encoder that selects from a plurality of different compression modes the most efficient mode for compressing the blocks of a "superblock" (i.e., macroblock), and then transmits the compressed macroblock and overhead data indicating which compression mode was used. It further describes a decoder that receives the compressed macroblock and overhead data, and based on which compression mode is indicated by the overhead data, decodes the received macroblock.

271. The '968 patent is "essential" to the adaptive compression scheme used in the H.264 Standard at every Level of the Baseline, Main, and High Profiles. At least one claim of the '968 patent covers adaptive compression as described by the H.264 Standard, and so Microsoft's products complying with the Standard – including Microsoft's Xbox and Windows 7 – would infringe this claim. (Exhibit 3269).

272. The subject matter of the '968 patent is an important aspect of prediction as it is performed in the H.264 Standard, because it provides greater flexibility in adaptively choosing compression modes, which leads to enhanced efficiency. Likewise, it allows video decoders to retrieve overhead data so that the decoder knows the compression mode used by the encoder and can perform the appropriate decompression corresponding to that compression mode.

273. U.S. Patent No. 5,144,423 does not disclose an acceptable alternative. It does not disclose compressing individual blocks contained in a superblock using a plurality of different compression modes, and would therefore be less efficient. Likewise, the alleged CCITT SGXV #453 alternative is not acceptable for the reason discussed for the '423 patent. The Ph. D. Thesis of Dr. Gary Sullivan does not disclose a suitable alternative, because it is limited to square block sizes, and thus requires coding additional overhead data when it would be more efficient to send overhead data for a rectangular block. Nor does Puri et al, "Interframe Coding with Variable Block-size Motion" disclose an acceptable alternative, because it does not perform motion compensation using different block sizes for the same video data to determine the size with the best compression, and thus would be less efficient. Specifying blocks as entry in single list as in

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MPEG-2 is not an alternative because the '968 patent does not require that the overhead data occur at any particular level of the syntax.

274. None of the alleged prior art references discloses each and every element of claim 19 of the '968 patent.

275. One of ordinary skill in the art would understand from the '968 patent specification that the structures corresponding to the claimed functions of the means-plus-function claims can be implemented in hardware or software.

C. The Eifrig '980 Patent Family—U.S. Patent No. 6,005,980

276. The '980 patent is directed to deriving a predictor motion vector ("PMV") for a block based on the motion vectors of that block's three neighboring blocks when at least one of the current block or the three neighboring blocks is field-coded.

277. The '980 patent is "essential" to the prediction motion vector scheme used in the H.264 Standard at the Main and High Profiles, Levels 2.1 to 4.1. At least one claim of the '968 patent covers deriving prediction motion vectors as described by the H.264 Standard, and so Microsoft's products complying with those Profiles/Levels of the Standard – including Microsoft's Xbox and Windows 7 – would infringe that claim. (Exhibit 3270).

278. The subject matter of the '980 patent is an important aspect of prediction as it is performed in the H.264 Standard, because it provides an efficient technique for motion estimation/motion compensation by using three neighboring blocks—left, top, and top-right.

279. Motorola contributed the '980 patent technology to the H.264 Standard through submissions to the JVT during the development of the H.264 Standard. Motorola's VCEG-O37 submission for the December 2001 meeting illustrated calculating a PMV using the motion vectors of the neighboring blocks.

280. The JVT adopted Motorola's prediction technique as the default in the H.264 Standard over the alternative left, top, and top-left neighboring blocks. The H.264 Standard uses the top-left neighboring block only when the top-right neighboring block is unavailable, because the top-right block provides better diversity of image information than the top-left block.

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281. Passing each field separately as a picture into the H.263 encoder of ITU-T Draft Recommendation H.263, May 2, 1996, § 6.1.1 is not disclosed in the Draft Recommendation and would not be an acceptable alternative, because it does not disclose how a picture can be coded using frame blocks where frame blocks are more efficient and using field blocks where field blocks are more efficient.

282. The alleged prior art references do not disclose each and every element of claim 13 of the '980 patent.

D. The Scan Patent Family—U.S. Patent Nos. 7,162,094 and 6,987,888

283. The '094 and '888 patents are directed to scan paths optimized for interlaced video.

284. The '094 patent discloses as an embodiment of the invention, FIG. 6, which shows a preferable scanning pattern for a 4×4 pixel block's frequency coefficient array.

285. The '888 patent discloses as an embodiment of the invention, FIG. 9, which shows a preferable scanning pattern for a 8×8 pixel block's frequency coefficient array.

286. The '094 patent is "essential" to the 4x4 field scan used in the H.264 Standard at the Main and High Profiles, Levels 2.1 to 4.1. At least one claim of the '094 patent covers the 4x4 field scan described by the H.264 Standard, and so Microsoft's products complying with those Profiles/Levels of the Standard – including Microsoft's Xbox and Windows 7 – would infringe that claim. (Exhibit 3271).

287. The '888 patent is "essential" to the 8x8 field scan used in the H.264 Standard at the High Profile, Levels 2.1 to 4.1. At least one claim of the '888 patent covers the 8x8 field scan described by the H.264 Standard, and so Microsoft's products complying with those Profiles/Levels of the Standard – including Microsoft's Xbox and Windows 7 – would infringe that claim. (Exhibit 3271).

288. The claimed subject matter of the '094 and '888 patents are an important aspect of the transform/quantization feature of the H.264 Standard, because the claimed 4×4 and 8×8 scan

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patterns result in significantly more compression than the traditional zig-zag pattern in many applications, including interlaced video coding.

289. Motorola's submissions to the JVT during the development of the H.264 Standard demonstrated that Motorola's inventions were better than the existing alternatives. Motorola submitted test results that showed that the 4×4 and 8×8 scan patterns of the '094 and '888 patents improved bitrate efficiency by up to 7% over the zig-zag scan pattern.

290. Third party video coding experts from Samsung and Sony verified the improved efficiency gains provided by Motorola's scan inventions. In JVT-D073, Samsung *et al.* stated that: "The computer simulation carried out using the current JM2.1 codec with CVLC demonstrated that additional bit rate reduction (BDBR) of up to 8.64 % and 6.15 % on average is possible." In JVT-E118, Sony stated that: "The simulation results show that by employing the proposed method coding efficiency gain by up to 3% will be obtained." Motorola's 4×4 and 8×8 scans were then adopted into the H.264 Standard.

291. The 4×4 field scan proposed by Sony in JVT-B068 does not disclose a suitable alternative. The JVT concluded for Sony's JVT-B068 proposal that: "Need to determine a larger gain for acceptance."

292. The 8×8 field scan used in MPEG-2 and referenced in Sony in JVT-B068 is not a suitable alternative. The JVT did not adopt the MPEG-2 field scan into the H.264 Standard and concluded for Sony's JVT-B068 proposal that: "Need to determine a larger gain for acceptance."

293. In ITC Investigation No. 337-TA-752, the Administrative Law Judge determined that the Xbox infringes claims 7, 8, and 10 of the '094 patent, and that those claims are not invalid.

E. The MBAFF Patent Family—U.S. Patent Nos. 6,980,596, 7,310,374, 7,310,375, 7,310,376, 7,310,377, 7,421,025, 7,477,690, 7,817,718

294. The '596 patent is directed to adaptive frame/field (AFF) coding on a group of neighboring macroblocks, for example on a pair of macroblocks (a 16 pixel wide by 32 pixel

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high luma region). This is referred to as macroblock adaptive frame/field ("MBAFF") coding in the H.264 Standard.

295. As disclosed in the '596 patent, it is preferable in some applications to be able to divide macroblocks coded in field mode into the same 7 block sizes that macroblocks coded in frame mode can be divided into (16 by16 pixels, 16 by 8 pixels, 8 by16 pixels, 8 by 8 pixels, 8 by 4 pixels, 4 by 8 pixels, and 4 by 4 pixels). This can be achieved by performing AFF coding on macroblock pairs instead of on single macroblocks. This keeps the basic macroblock structure intact, and permits motion compensation on areas as large as the size of a macroblock for both frame mode and field mode macroblocks.

296. The '374 patent is directed to the MBAFF technique discussed above in connection with a plurality of smaller portions (*e.g.*, macroblock pairs) that have been encoded in inter coding mode. In inter coding mode, prediction is performed using pictures other than the current picture being coded.

297. The '375 patent is directed to the MBAFF technique discussed above in connection with a plurality of smaller portions (e.g., macroblock pairs) that have been encoded in intra coding mode. In intra coding mode, prediction is performed using only macroblocks from the current picture being coded.

298. The '376 patent is directed to the MBAFF technique discussed above in connection with a plurality of processing blocks (*e.g.*, macroblock pairs), where decoding is performed in a horizontal or vertical scanning path.

299. The '377 patent is directed to the MBAFF technique discussed above in connection with a plurality of smaller portions (e.g., macroblock pairs), where at least one macroblock pair is encoded in intra coding mode and at least one macroblock pair is encoded in inter coding mode.

300. The '025 patent is directed to the MBAFF technique discussed above in connection with a plurality of smaller portions, where each of the smaller portions has a size that is a multiple of a pair of macroblocks.

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301. The '690 patent is directed to the MBAFF technique discussed above in connection with a plurality of smaller portions (*e.g.*, macroblock pairs), where at least one macroblock in the macroblock pair is skipped.

302. The '718 patent is directed to the MBAFF technique discussed in connection with a plurality of smaller portions (*e.g.*, macroblock pairs), where at least two motion vectors are derived for at least one block in a bi-predicted picture.

303. The '596, '374, '375, 376, '377, '025, '690 and '718 patents are "essential" to the MBAFF and prediction techniques used in the H.264 Standard at the Main and High Profiles, Levels 2.1 to 4.1. At least one claim of each of the MBAFF patents covers the MBAFF and prediction techniques described by the H.264 Standard, and so Microsoft's products complying with those Profiles/Levels of the Standard – including Microsoft's Xbox and Windows 7 – would infringe those claims. (Exhibit 3272).

304. The subject matter claimed by the MBAFF patents are important aspects of the AFF and prediction features of the H.264 Standard, because they allow greatly enhanced coding efficiency through the use of macroblock pairs and all seven block sizes in field mode coding.

305. Motorola's submissions to the JVT during the development of the H.264 Standard demonstrated that Motorola's MBAFF inventions performed better than existing alternatives. Motorola submitted test results that showed that the MBAFF invention could achieve up to about 18% savings in the bit rate.

306. Third party video coding experts from Sony and VideoTele verified the improved efficiency gains provided by Motorola's MBAFF invention, and recommended MBAFF for adoption into the H.264 Standard. In JVT-D081, Sony stated that: "We regard this feature [MBAFF] important for developing SDTV/HDTV applications with JVT coding technology. This contribution provides supportive information on MB-level field/frame adaptive coding. We recommend [sic] the proposal be adopted." In JVT-E067, VideoTele reported that: "Our simulation results support that macroblock-level frame/field adaptive coding is a useful

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technique in the JVT standard, giving a bit rate savings of 11% to 18% on the two sequences tested."

307. AFF coding on a single macroblock as in VCEG-N57r2 and VCEG-N76 does not disclose a suitable alternative, because the block sizes of 16×16 and 8×16 are not available for a single macroblock in field mode, and therefore would result in less efficient compression.

308. In ITC Investigation No. 337-TA-752, the Administrative Law Judge determined that the Xbox infringes claims 1 and 2 of the '596 patent, and that claim 2 of the '596 patent is not invalid.

F. The PAFF Patent Family—U.S. Patent Nos. 7,769,087, 7,660,353, and 7,839,931

309. The '087 patent is directed to deciding, on a picture-by-picture basis, whether to code a bi-predicted picture in a frame mode or in a field mode, where the picture has two motion vectors, which can both point in the forward or backward direction (i.e., can both refer to earlier or later pictures/fields).

310. The '353 patent is directed to deciding, on a picture-by-picture basis, whether to code a bi-predicted picture in frame mode or in field mode, where the picture has two motion vectors, the second of which is encoded as an offset of the first.

311. The '931 patent is directed to deciding, on a picture-by-picture basis, whether to code a picture in frame mode or in field mode, where the reference pictures are indexed.

312. The '087, '353 and '931 patents are "essential" to the PAFF and prediction techniques used in the H.264 Standard at the Main and High Profiles, Levels 2.1 to 4.1. At least one claim of each of the PAFF patents covers the PAFF techniques described by the H.264 Standard, and so Microsoft's products complying with those Profiles/Levels of the Standard – including Microsoft's Xbox and Windows 7 – would infringe those claims. (Exhibit 3273).

313. The subject matter claimed by the PAFF patents is important to the AFF and prediction features of H.264 Standard because it allows for greater coding efficiency.

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314. Motorola's submissions to the JVT during the development of the H.264 Standard demonstrated that PAFF performed better than alternatives. PAFF coding was reported to reduce bit rates in the ranges of 16% to 20% over frame-only coding mode. Also, Motorola's JVT-B071 submission states that "[picture level adaptive coding] guarantees a performance over frame and field coding." Motorola's PAFF inventions provided for even greater reduction in bit rates, because being able to choose two reference pictures in the future or two reference pictures in the past provided more flexibility than being limited to choosing one reference picture in the future and one in the past. Deriving the second motion vector using an offset from the first motion vector and using unique reference numbers also allowed for greater coding efficiency.

315. PAFF as it existed before Motorola's contributions in MPEG-2 Part 2 does not disclose a suitable alternative to the '087 patent, because it would not be as flexible in terms which directions the motion vectors could point, and therefore would be less efficient.

316. PAFF as it existed before Motorola's contributions in MPEG-2 Part 2 does not disclose a suitable alternative to the '353 patent, because it would not be as flexible in terms of how a second motion vector is encoded with respect to the first motion vector, and therefore would be less efficient.

317. PAFF as it existed before Motorola's contributions in MPEG-2 Part 2 does not disclose a suitable alternative to the '931 patent, because it would not be as flexible in terms of the number of reference pictures.

318. AFF coding on a single macroblock as in VCEG-N57r2 and VCEG-N76 does not disclose a suitable alternative, because the block sizes of 16×16 and 8×16 are not available for a single macroblock in field mode, and therefore would result in less efficient compression.

319. The PAFF patents are not invalid. The PAFF patents claim the benefit of priority from 8 provisional applications. There is no evidence to suggest that any alleged prior art reference discloses each and every limitation of the claims of the PAFF patents.

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G. The Gandhi '514 Patent Family—U.S. Patent No. 6,836,514

320. Motorola's '514 patent is directed to the byte stream format feature of the H.264 Standard, Annex B.3. This feature is optional. The '514 patent discloses identifying transport errors by finding inconsistencies in timestamps and other indicia in various parts of the bitstream and, when an error is identified, attempting to mitigate it.

321. With the innovation disclosed in the '514 patent, the visible effects of transmission errors are greatly reduced in the immediate picture and in any pictures which use that picture as a reference picture.

H. Current Use of the Motorola H.264 Essential Patents in Microsoft Products

1. Microsoft's Use of H.264

(a) Microsoft's Products

322. The following list of Microsoft products use the H.264 Standard: Windows Vista (from February 2011 and after), Windows 7, Windows 8, Windows Server 8, Windows Home Server (some FY11 and FY12 versions), Windows Storage Server (some FY12 versions), Xbox 360S, Xbox 720, Windows Phone 7 (and 7.5), Windows Phone 8, Skype (some versions), Surface Tablet, Visual Studio (some FY10-FY12 versions), Silverlight (version 3 and later), Microsoft Media Pack for Moonlight (versions 3 and 4), Zune for Windows and Expression (versions 2, 3, and 4), Windows Embedded (Microsoft AVC decoder in some FY11 and FY12 versions), Windows Embedded (Adobe AVC decoder in some versions of CE 6 and Embedded 7), and Lync W15 / O15.

323. Microsoft's Xbox products support the Baseline, Main and High Profiles of the H.264 Standard up to Level 4.1.

324. Microsoft's Windows 7 H.264 decoder supports the Baseline, Main and High profiles of the H.264 Standard up to Level 5.1. Microsoft's Windows 7 H.264 encoder supports the Baseline and Main Profiles of the H.264 Standard.

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325. Microsoft's Windows 8 H.264 decoder supports the Baseline, Main and High profiles of the H.264 Standard up to Level 5.1. Microsoft's Windows 8 H.264 encoder supports the Baseline, Main and High Profiles of the H.264 Standard.

326. Microsoft's Windows Vista (from February 2011 and after) H.264 decoder supports the Baseline, Main and High profiles of the H.264 Standard up to Level 5.1.

327. Microsoft's Windows Embedded (Adobe AVC decoder in some FY11 and FY 12) products support the Baseline, Main and High Profiles of the H.264 Standard.

328. Microsoft's Zune for Windows and Expression (versions 2, 3, and 4) support the Baseline and Main profiles of the H.264 Standard at all bitrates and resolutions.

329. Microsoft's Windows Phone 7 (and 7.5) products that use the Qualcomm 8x50 or 8x55 processors support the Baseline, Main, and High Profiles of the H.264 Standard up to Level 3.1.

330. Microsoft's Lync W15/015 supports Constrained Baseline, Constrained High, and Scalable Constrained High of the H.264 Standard up to Level 3.1.

331. Microsoft's Skype (some versions) supports the Constrained Baseline of the H.264 Standard at Level 3.1.

332. Microsoft's Silverlight (version 3 and later) supports the Baseline, Main and High Profiles of the H.264 Standard for progressive video only.

333. Microsoft's Xbox 720 under development is planned to support Blu-ray, which uses the Main Profile at Levels 3.0-4.1 and the High Profile at Levels 4.0 and 4.1.

2. Motorola's Krause '419 Patent Family

334. All of Microsoft's products that support the H.264 Standard make use of Motorola's '419 patent family.

335. A German Court has adjudicated that the Xbox 360, Windows 7, Windows Internet Explorer 9 and Windows Media Player 12 infringe claim 19 of Motorola's EP 0538667.

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3. Motorola's Wu '968 Patent Family

336. All of Microsoft's products that support the H.264 Standard make use of Motorola's '968 patent family.

337. A German Court has adjudicated that the Xbox 360, Windows 7, Windows Internet Explorer 9 and Windows Media Player 12 infringe claim 17 of Motorola's EP 0615384.

4. Motorola's Eifrig '980 Patent Family

338. All of Microsoft's products that support Main and High Profiles of the H.264 Standard at any of Levels 2.1 to 4.1, including Xbox 360, Xbox 720, Windows 7, Windows 8 Windows Vista (from February 2011 and after), Windows Embedded (Adobe AVC decoder in some versions of CE 6 and Embedded 7), Zune for Windows and Expression (versions 2, 3, and 4), Windows Phone 7 (and 7.5), use Motorola's '980 patent family.

5. Motorola's Scan Patent Family

339. All of Microsoft's products that support the Main and High Profiles of the H.264 Standard at any of Levels 2.1 to 4.1, including Xbox 360, Xbox 720, Windows 7, Windows 8 Windows Vista (from February 2011 and after), Windows Embedded (Adobe AVC decoder in some versions of CE 6 and Embedded 7), Zune for Windows and Expression (versions 2, 3, and 4), Windows Phone 7 (and 7.5), use of Motorola's '094 patent.

340. All of Microsoft's products that support the High Profile of the H.264 Standard at any of Levels 2.1 to 4.1, including Xbox 360, Xbox 720, Windows 7, Windows 8 Windows Vista (from February 2011 and after), Windows Embedded (Adobe AVC decoder in some versions of CE 6 and Embedded 7), Windows Phone 7 (and 7.5), use of Motorola's '888 patent.

341. The '094 patent was involved in an investigation by the International Trade Commission in connection with Microsoft's Xbox 360 (ITC Investigation No. 337-TA-752). The Administrative Law Judge in that case determined that the Xbox 360 infringes claims 7, 8, and 10 of the '094 patent and that those claims are not invalid.

342. Windows 7 plays H.264 video containing 4×4 field blocks.

343. The Xbox 360 plays H.264 video containing 4×4 field blocks.

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344. Microsoft teaches to use the Xbox as a "home entertainment and video game system." User documentation for Microsoft's Xbox specifically instructs users how to play video.

345. Microsoft has partnered with AT&T U-Verse to deliver interlaced video to the Xbox as a set-top box.

346. At least some H.264 bitstreams from AT&T U-verse contain interlaced video.

6. Motorola's MBAFF Patent Family

347. All of Microsoft's products that support the Main and High Profiles of the H.264 Standard at any of Levels 2.1 to 4.1, including Xbox 360, Xbox 720, Windows 7, Windows 8 Windows Vista (from February 2011 and after), Windows Embedded (Adobe AVC decoder in some versions of CE 6 and Embedded 7), Zune for Windows and Expression (versions 2, 3, and 4), Windows Phone 7 (and 7.5), use of Motorola's MBAFF patent family.

348. The '596 patent was involved in an investigation by the International Trade Commission in connection with Microsoft's Xbox 360 (ITC Investigation No. 337-TA-752). The Administrative Law Judge in that case determined that the Xbox 360 infringes claims 1 and 2 of the '596 patent, and that claim 2 of the '596 patent is not invalid.

349. Windows 7 plays MBAFF-encoded video.

350. The Xbox 360 plays MBAFF-encoded video.

351. Survey results show that approximately 16% of users of the Xbox 360 who have used the Xbox to watch videos have watched MBAFF-encoded video.

352. Microsoft teaches to use the Xbox as a "home entertainment and video game system." User documentation for Microsoft's Xbox specifically instructs users how to play video.

353. Microsoft has partnered with AT&T U-Verse to deliver interlaced video to the Xbox as a set-top box.

354. At least some H.264 bitstreams from U-verse are MBAFF-encoded.

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7. Motorola's PAFF Patent Family

355. All of Microsoft's products that support the Main and High Profiles of the H.264 Standard at any of Levels 2.1 to 4.1, including Xbox 360, Xbox 720, Windows 7, Windows 8 Windows Vista (from February 2011 and after), Windows Embedded (Adobe AVC decoder in some versions of CE 6 and Embedded 7), Zune for Windows and Expression (versions 2, 3, and 4), Windows Phone 7 (and 7.5), use of Motorola's PAFF patent family.

8. Use of H.264

356. H.264 is currently the most widely used video coding format.

357. Transmitting video in interlaced format requires only half the data that is required to transmit a progressive picture at the same frame rate.

358. In a submission to MPEG for the July 2012 meeting, NBC Universal, HBO, CBS Corp., Canadian Broadcasting Co., Motorola Mobility, Comcast, and Cable Labs stated: "interlaced scan formats remain ubiquitous," and "[i]n current cable, satellite and telco distribution systems, 1080i, 480i and 576i formats are in widespread use around the world."

359. Microsoft states on its Windows media web site that "Interlaced video is widely used in television broadcasting."

360. Microsoft states on its Windows support web site that "interlaced" is a "feature . . . of increasing importance" for content sent to "DVD players, set-top boxes and other home electronics."

361. The industry requested support for interlaced coding tools in the Stereo High Profile extension, and it was added in 2010.

362. The Internet is a source of interlaced H.264 video content.

363. Because H.264 can offer 2.5 to 3 times more bandwidth-efficiency improvement over MPEG-2, IPTV providers have transitioned to H.264.

364. AT&T U-verse TV delivers H.264 interlaced content using IPTV.

365. Blu-ray requires support of H.264 interlaced content.

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366. H.264 encoder, decoder and transcoder datasheets advertise support for the MBAFF and PAFF features of H.264.

IX. MICROSOFT'S H.264 PATENTS

A. Patents Relating to Prediction—U.S. Patent Nos. 7,033,035, 7,646,810, 7,280,700, 7,609,767, 7,116,830, 7,263,232, 7,577,305, 7,162,091 and 7,181,072

367. The '035 patent does not appear to read on the H.264 Standard because the H.264 Standard does not include an enhanced Direct Prediction model that includes a submode selected from a group comprising a weighted average submode.

368. At the time that the H.264 Standard was being developed, there existed alternatives to the techniques claimed in the '035, '810, '700, '767, '830, '232, '305, '091, and '072 patents that offered comparable performance.

369. **U.S. Patent Nos. 7,033,035 and 7,646,810.** Several alternatives were proposed during the development of the H.264 Standard by a number of companies, including Motorola and Matsushita, who made proposals directed to direct mode using temporal prediction.

370. Another alternative was to replace temporal prediction for a direct mode macroblock in a B slice with another type of prediction, such as a weighted average of temporal and spatial prediction (an alternative discussed in the '035 and '810 patents).

371. **U.S. Patent No. 7,280,700**. In addition to the alternatives discussed above with respect to the '810 patent, two other alternatives were to signal the type of direct mode prediction at the macroblock level rather than the slice level, and to use slice-level syntax that indicates a decision between more than just spatial direct mode prediction and temporal direct mode prediction.

372. **U.S. Patent No. 7,609,767**. The concept of weighting different prediction blocks for direct mode macroblocks based upon their proximity to the B picture in order to provide better coding for fading sequences was proposed by Real Networks.

373. Other alternatives were to signal fading compensation at the macroblock layer rather than a layer higher than the macroblock layer, or to convey the fading parameters

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implicitly. An advantage of the alternative implicit method is that no explicit signaling bits are necessary to determine which parameters to use.

374. **U.S. Patent Nos. 7,116,830 and 7,577,305**. One alternative available at the time was, if the first contextual spatial extrapolation mode equals the second contextual spatial extrapolation mode, to set the predicted spatial extrapolation mode to the second contextual spatial extrapolation mode.

375. Another technique available at the time was to use a flag that when equal to, *e.g.* 0, signals to use a predicted mode, or when equal to, *e.g.*, 1, signals to use an actual mode that is specified in the bitstream without computing the actual mode from the predicted mode.

376. **U.S. Patent No. 7,263,232**. Alternatives that were available included the techniques described above with respect to the '830 and '305 patents.

377. **U.S. Patent Nos. 7,162,091 and 7,181,072.** One alternative was to assign the pixels of a top left block of a frame a value other than a gray value, such as a gradient of values.

378. Another alternative was to predict blocks in the top row by multiple blocks left of the current block rather than just the block immediately left.

B. Patents Relating to Transform/Quantization—U.S. Patent Nos. 6,882,685, 7,106,797, 7,773,671, 7,839,928, 7,881,371, and 7,266,149

379. The '671 patent does not appear to read on the H.264 Standard because the H.264 Standard does not appear to require executing "sixteen left shift operations, plural addition operations, and plural subtraction operations per 4x4 block of the information."

380. At the time that the H.264 Standard was being developed, there existed alternatives to the techniques claimed in the '685, '797, '671, '928, '371, and '149 patents that offered comparable performance.

381. **U.S. Patent Nos. 6,882,685, 7,106,797, 7,773,671, 7,839,928 and 7,881,371.** Two alternative transforms were proposed by FastVDO and Texas Instruments during the development of the H.264 Standard.

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382. The Ad-Hoc Group formed to investigate and compare the proposed transforms found that all of the competing transforms (Microsoft's, FastVDO's, and T.I.'s) provided equivalent and adequate coding performance. The competing transforms each had advantages over the Microsoft transform. The Texas Instruments transform, a modified version of the integer transform already in the existing TML, had the advantage of using single value or scalar quantization, but required more arithmetic and multiply operations than the FastVDO and Microsoft proposals. The FastVDO transform required fewer arithmetic operations than the T.I. transform, and required no multiply operations for 9-bit residuals, and was exactly invertible, but it had slightly more operations than the Microsoft proposal.

383. With respect to the '671, '928, and '371 patents, an alternative available at the time was to use a transform that is orthonormal so that one would not need multiple tables of quantization parameters, which would advantageously require less memory than storing multiple tables of quantization parameters. For instance, the Texas Instruments proposal used an orthonormal transform, allowing the quantization to be done by a single scalar multiplier rather than a matrix multiplier.

384. **U.S. Patent No. 7,266,149.** Alternatives to the '149 patent available at the time included proposals from Telenor and Mathias Wien. VCEG Q15-I-39, Q15-J-41, Q15-K-24, Q15-K-25, L12, L15, N49, and O30 discussed applying 4×4, 8×8 and 16×16 transforms based upon the prediction block size. The adaptive use of 4×4 and 8×8 transforms proposed by Wien and Bjontegaard was adopted into the H.264 Standard.

385. VCEG Q15-I-39, Q15-J-41, Q15-K-24, Q15-K-25, L12, L15, N49, and O30 are alternatives to the '149 patent because the block size and transform size do not need to be signaled separately because the block size determines the transform size. Transmitting block size and inferring transform size rather than transmitting the two flags required by the '149 patent (which requires more bits) could be expected to offer comparable performance.

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C. Patents Relating to Video Layer Syntax—U.S. Patent Nos. 6,563,953, 6,735,345, and 7,289,673, and 7,379,607

386. At the time that the H.264 Standard was being developed, there existed alternatives to the techniques claimed in the '953, '345, '673, and '607 patents that offered comparable performance.

387. **U.S. Patent Nos. 6,563,953, 6,735,345, and 7,289,673.** One alternative to jointly encoding the coded block patterns for chroma and luma is to code them separately.

388. Another alternative available at the time was to send "macroblock type" separately from the variable length code representing the coded block pattern information.

389. With respect to the '953 and the '345 patents, an alternative available at the time was to omit the coded block pattern when the macroblock type is "intra," as was taught by Matsumura.

390. **U.S. Patent No. 7,379,607.** One alternative available at the time was to signal the decoder to skip certain macroblocks using the syntax used in MPEG-2. In this standard, the macroblock skip flag was encoded at the macroblock layer of the syntax. Encoding the macroblock skip flag at the macroblock layer would offer comparable performance to the '607 patent because doing so would not have the disadvantages in the context of H.264 that it would in the context of MPEG-2 since, in H.264, the first macroblock address is provided at the slice level.

D. Patent Relating to Deblocking —U.S. Patent No. 7,120,197

391. At the time that the H.264 Standard was being developed, there existed alternatives to the techniques claimed in the '197 patent that offered comparable performance.

392. One alternative was to use in-loop deblocking to remove blocking artifacts was known and used at least as early as H.263.

393. Another alternative was Telenor's proposal in May 2000 for an adaptive strength deblocking filter within the motion compensation loop with an algorithm that adapts the strength of the filtering based upon the discontinuity across a boundary ("S0 = abs(4c-f)+12(e-d) +

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abs(9(c-d-e+f))"), and the discontinuity on each side of the boundaries ("S01 = 12abs(a-2b+c)" and "S02 = 12abs(e-2f+g)).

E. Patents Relating to SP Slices—U.S. Patent Nos. 6,912,584, 7,685,305, and 7,734,821

394. SP pictures are part of the H.264 Standard only for the Extended Profile.

395. At the time that the H.264 Standard was being developed, there existed alternatives to the techniques claimed in the '584, '305, and '821 patents that offered comparable performance.

396. One alternative available at the time was to use intra (I) slices, instead of SP slices, to provide switching points and error resilience. Using intra (I) slices instead of SP slices has the advantage of minimizing the complexity of the decoder by limiting the possible picture types to I, P and B.

F. Annex Patents

1. Annex B—U.S. Patent Nos. 7,505,485 and 7,839,895, 7,248,740,

397. A compliant decoder does not have to use Annex B.3.

398. The features in Annex B.3 are only ancillary. Accordingly, it is possible to design an H.264 decoder that does not use the techniques claimed in the '740 patent.

399. At the time that the H.264 Standard was being developed, there existed alternatives to the techniques claimed in the '485 and '895 patents that offered comparable performance.

400. One alternative available at the time was to design the video syntax format to avoid start code emulation, as was done in H.261, MPEG-1, H.262/MPEG-2, H.263, and MPEG-4. Such an approach would use fewer bits by omitting the "stuffing" bits.

401. Another alternative available at the time was to explicitly allow start code emulations to occur. Such an approach required significantly more decoding attempts only in error-prone environments, where multiple decoding attempts could be expected anyway due to errors in transmission.

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2. Annex C—U.S. Patent Nos. 7,646,816 and 7,593,466

402. Annex C does not require a compliant decoder to receive or process multiple sets of reference decoder parameters from the bitstream.

403. A compliant decoder does not have to use the SEI messages in Annex C.

404. The features in Annex C are only ancillary. Accordingly, it is possible to design an H.264 decoder that does not use the techniques claimed in the '816 and '466 patents.

3. Annex D—U.S. Patent Nos. 7,024,097, 7,142,775, 7,167,633, 7,171,107, 7,248,779, 7,242,437, 7,633,551, 7,271,849, 7,274,407, 7,286,189, and 7,149,247

405. A compliant decoder does not have to use the SEI messages in Annex D.

406. The features in Annex D are only ancillary. Accordingly, it is possible to design an H.264 decoder that does not use the techniques claimed in the '097, '775, '633, '107, '779, '437, '551, '849, '407, '189, and '247 patents.

4. Annex E—U.S. Patent No. 7,155,055

407. A compliant decoder does not need to use the VUI parameters in Annex E.

408. The features in Annex E are only ancillary. Accordingly, it is possible to design an H.264 decoder that does not use the techniques claimed in the '055 patent.

X. THE MOTOROLA/MICROSOFT NEGOTIATIONS

409. On October 1, 2010, Microsoft filed suit in the United States District Court for the Western District of Washington at Seattle, against Motorola, Inc., claiming infringement of nine U.S. Patents. That same day, Microsoft filed a Complaint with the United States International Trade Commission, alleging infringement of the same nine U.S. Patents and requesting that the Commission enter an exclusion order barring import of Motorola's smartphone and tablet devices. Of the nine patents, Motorola was found to infringe only one patent.

410. [redacted]

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411. On October 21, 2010, Motorola's VP of Intellectual Property, Kirk Dailey, sent an "offer to license" letter to Microsoft's VP and Deputy General Counsel, Horacio Gutierrez. The October 21 letter offered to grant Microsoft a worldwide license to Motorola's portfolio of patents and patent applications relating to the IEEE 802.11 Standards. The letter included Motorola's offer to grant the license under reasonable and non-discriminatory terms and conditions and included Motorola's standard terms. These standard terms included an offer to license the patents at a royalty rate of 2.25% of the price per unit for each 802.11 compliant product sold by Microsoft. The letter indicated that the offer was "subject to a grant back license under the 802.11 essential patents of Microsoft." In the October 21, 2010 letter, Motorola also offered a license to less than its entire portfolio of 802.11 essential patents, if desired by Microsoft, again "on RAND terms." A "non-exhaustive" list of 28 U.S. Patents (and their respective foreign counterparts) to be included by Motorola in the license was attached. In order to facilitate a response, Motorola indicated that it would "leave this offer open for 20 days."

412. On October 29, 2010, Motorola sent Microsoft another "offer to license" letter. This letter offered to grant Microsoft a worldwide license to Motorola's portfolio of patents and patent applications relating to the ITU-T Recommendation H.264 ("H.264"). The letter included the offer to grant the license under reasonable and nondiscriminatory terms and conditions and included Motorola's standard terms. These standard terms include an offer to license the patents at a royalty rate of 2.25% of the price per unit for each H.264 compliant product. The offer also was made "subject to a grant back license under the H.264 essential patents of Microsoft." A "non-exhaustive" list of 18 U.S. patents (and their respective foreign counterparts) to be included by Motorola in the license was attached to the letter. In order to facilitate a response, Motorola indicated that it would "leave this offer open for 20 days." In its Patent Declarations related to the H.264 patents, Motorola selected the option that its agreement to grant licenses was based on "reciprocity." In the October 29, 2010 letter, Motorola also offered a license on less than its entire portfolio of H.264 essential patents, again "on RAND terms."

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413. Since October 1, 2010, the parties have sent at least [redacted] communications to each other in an effort to resolve their licensing dispute. These communications are summarized in Exhibit 3335. Motorola made its most recent offer on June 18, 2012, indicating that Motorola remained willing to license its 802.11 and H.264 portfolios, and to take a license to Microsoft's ActiveSync patent portfolio, and to enter broader cross-licensing discussions, if Microsoft desired to do so. The June 18, 2012 letter included a revised license offer for Motorola's H.264 and 802.11 portfolios. Exhibit 3335.

XI. OVERVIEW OF MOTOROLA'S LICENSING PROGRAM

414. Motorola's licensing team typically includes (1) a lead negotiator; (2) support from the legal department; (3) team members responsible for financial reporting and forecasting; and (4) and engineers who provide technical support. Licensing negotiations typically take over a year to complete. Renewals take less time than new license agreements to conclude.

415. Since the mid-1990s, Motorola has had an established, standard practice of offering its core portfolios of SEPs (including for 802.11 and H.264) for license at rates around 2.25% of net selling price of end products [redacted]

416. [redacted]

417. Motorola has a policy of not stacking rates for its portfolios of SEPs. Under that policy, Motorola charges a single, maximum rate for its portfolios, no matter how many portfolios are implemented in a single licensed device.

418. Motorola participates in some patent pools but not others, and makes such determinations on a case-by-case basis. [redacted]

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[redacted]

419. [redacted]

420. Motorola (through its subsidiary General Instruments Corp.) elected to join MPEG LA's MPEG-2 pool as a licensor and licensee at the time of pool formation. The royalty rate for MPEG-2 licensees was initially set at $4 per decoder.

XII. MOTOROLA'S HISTORICAL LICENSES, INCLUDING ITS 802.11 AND H.264 PORTFOLIOS LICENSES

421. Motorola has entered into at least [redacted] agreements that grant rights to at least one of Motorola's 802.11 or H.264 essential patents. These agreements are summarized in Exhibit 3334.

422. Motorola has entered into [redacted] licenses that grant explicit rights to Motorola's 802.11-essential patent portfolio: [redacted].

423. [redacted]

424. [redacted]

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[redacted]

425. [redacted]

[redacted]

426. [redacted]

[redacted]

427. [redacted]

[redacted]

428. [redacted]

[redacted]

429. [redacted]

agreement for various wireless communications standards, including WiFi (802.11), certain

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[redacted]

430. [redacted]

[redacted]

431. [redacted]

[redacted]

432. [redacted]

[redacted]

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433. Motorola has also entered into [redacted] agreements that involve explicit rights to its H.264 portfolio. [redacted]

434. [redacted]

435. [redacted]

436. [redacted]

437. [redacted]

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[redacted]

438. [redacted]

[redacted]

439. [redacted]

[redacted]

440. [redacted]

[redacted]

441. [redacted]

[redacted]

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[redacted]

442. [redacted]

[redacted]

443. [redacted]

[redacted]

444. [redacted]

[redacted]

445. [redacted]

[redacted]

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[redacted]

446. [redacted]

[redacted]

XIII. MICROSOFT'S HISTORICAL LICENSES, INCLUDING ITS 802.11 AND H.264 PORTFOLIOS LICENSES

447. [redacted]

[redacted]

448. Microsoft is a Licensee of the MPEG LA's AVC/H.264 Patent Pool. Therefore, in addition to receiving a royalty for other licensees' sales of H.264-compliant products, it also receives a pool license for its own H.264-compliant products.

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449. [redacted]

[redacted]

XIV. THE VALUE OF MOTOROLA'S 802.11 PATENTS TO MICROSOFT'S PRODUCTS

450. Most electronic devices with the ability to connect to the internet, such as, for example, smartphones, gaming systems, PCs, and tablets, include Wi-Fi functionality. There is an expectation by consumers that such devices will include this functionality.

451. [redacted]

452. [redacted]

[redacted]

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453. Frequent Xbox users who utilize Motorola's 802.11 technology will often buy multiple accessories, including controllers, headsets, and the Kinect.

454. [redacted]

455. 802.11 functionality has certain advantages over wired and cellular connectivity.

456. Microsoft sells an 802.11-compliant adapter to add Wi-Fi functionality to older Xbox gaming systems, which from 2006 to 2010 sold for an average of $69.18.

XV. THE VALUE OF MICROSOFT'S 802.11 PATENTS TO MOTOROLA'S PRODUCTS

457. Motorola's smartphones include 802.11 functionality and such functionality is expected by consumers in Motorola's smartphones.

458. Without 802.11 functionality in its smartphones, Motorola would not be able to compete in the marketplace.

XVI. THE VALUE OF MOTOROLA'S H.264 PATENTS TO MICROSOFT'S PRODUCTS

459. Most electronic devices with the ability to decode video, like smart phones, gaming systems, PCs, tablets and the like, can decode H.264 video. There is an expectation by consumers that such devices will include this functionality. H.264 functionality is an important feature of both Windows and Xbox.

460. H.264 is currently one of the most commonly used formats for the recording, compression, and distribution of high definition video, and provides significant performance improvements over prior technologies.

461. [redacted]

462. [redacted]

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463. The demand for streaming H.264-encoded movies, TV shows, and Internet video through Xbox Live also provides Microsoft with revenues through user subscriptions to the Xbox Live service.

464. Motorola's patented H.264 technology is used for encoding and decoding high-definition video across a large swath of Microsoft's product line, including the Xbox 360, Windows 7, Windows Phone 7, several additional software programs such as Internet Explorer, and future products such as Windows 8 and the next-generation Xbox.

XVII. THE VALUE OF MICROSOFT'S H.264 PATENTS TO MOTOROLA'S PRODUCTS

465. Motorola's smartphones include H.264 functionality and such functionality is expected by consumers in Motorola's smartphones.

466. Without H.264 functionality in its smartphones, Motorola would not be able to compete as successfully in the marketplace.

XVIII. THE HYPOTHETICAL NEGOTIATION BETWEEN THE PARTIES

467. The starting point for the hypothetical negotiation between Motorola and Microsoft would have been the 2.25% of the net selling price of covered products, as set forth in Motorola's October 2010 offer letters.

468. [redacted]

469. [redacted]

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[redacted]

470. [redacted]

[redacted]

471. The Motorola and Microsoft hypothetical negotiators would have reached the following factual conclusions with respect to the *Georgia-Pacific* Factors concerning 802.11:

a. [redacted]

b. [redacted]

c. [redacted]

d. [redacted]

e. [redacted]

f. [redacted]

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[redacted]

g. [redacted]

h. [redacted]

472. The Motorola and Microsoft hypothetical negotiators would have reached the following factual conclusions with respect to the *Georgia-Pacific* Factors concerning H.264:

a. [redacted]

b. [redacted]

c. [redacted]

[redacted]

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[redacted]

d. [redacted]

e. [redacted]

f. [redacted]

g. [redacted]

h. [redacted]

i. [redacted]

j. [redacted]

XIX. PATENT POOLS GENERALLY

473. Patent pools are created by two or more standard-essential patent owners or by an administrator of a prospective patent pool who collects standard-essential patent owners to act as licensors, with the purpose of licensing standard-essential patents to third party licensees, and usually to the other licensors, in a single licensing package. Participation in a patent pool is voluntary.

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474. By taking a license to a pool of standard-essential patents, an implementer of the standard may design and market his standard-compliant product without concerns of a claim of patent infringement from any member of the pool. In this way, an implementer can achieve substantial freedom of operation through obtaining rights to use patents of many different companies in a single license. Firms with substantial cross-licensing agreements may not need the "one stop shopping" of a patent pool to maintain freedom of operation.

475. Patent pools typically have lower rates than can be achieved through bilateral, private negotiations. There are many factors that make patent pools more likely to have rates lower than the rates in bilaterally negotiated licenses, including the fact that: (1) the principal objective of most pools is to minimize royalty exposure and maximize freedom of operation for licensees, which drives down the royalty rate; (2) pools that allocate revenue based on patent-counting ignore the value of the patents being licensed, which deters holders of high-value SEPs from joining as licensors; (3) due to the non-negotiable nature of pool patent licenses, royalty rates must be low to entice licensees to join; (4) pools have low licensing transaction costs that allow for lower rates; and (5) concerns over antitrust scrutiny leads to lower rates.

476. Given that bilateral licensing transaction costs can be considerable and that a licensing program consumes valuable internal resources, patent holders may decide to forego seeking bilateral licenses (even though they could probably realize higher royalties) in favor of pools. Despite the lower than market rates, a pool provides freedom of operation and a guaranteed licensing revenue stream. The low rates of pools are offset by the potential for high volume licensing.

477. Other things remaining the same, the higher the value of an owner's SEPs and the stronger its licensing program, the lower is its incentive to join a patent pool.

478. Companies that have SEPs for a given standard, but also have products with high potential infringement exposure to others' SEPs for that standard, may decide to join a pool even though they may not obtain commercially reasonable value for their standard-essential patents licensed through the pool. As an example, Microsoft did not join the MPEG LA pool to generate

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a revenue stream from its SEPs. Dean Hachamovitch, Microsoft's Vice President in Charge of Internet Explorer, published a blog posting entitled "Follow Up on HTML5 Video in IE9" on Microsoft's MSDN Blogs (dated May 3, 3010, 12:02 AM), available at http://blogs.msdn.com/b/ie/archive/2010/05/03/follow-up-on-html5-video-in-ie9.aspx, in which he explained that "Microsoft pays into MPEG-LA about twice as much as it receives back for rights to H.264. Much of what Microsoft pays in royalties is so that people who buy Windows (on a new PC from an OEM or as a packaged product) can just play H.264 video or DVD movies. Microsoft receives back from MPEG-LA less than half the amount for the patent rights that it contributes because there are many other companies that provide the licensed functionality in content and products that sell in high volume."

479. In contrast, a party with a strong or broad patent portfolio may decline to join a patent pool if it will see a greater return on its investment in developing its standard-essential technology through negotiating individual licenses with potential licensees. For example, of the top eight firms holding SEPs for H.264, three firms declined to join MPEG LA's AVC/H.264 pool. Specifically, Nokia, Motorola, and IBM are not pool members.

480. Patent pools generally (and the specific pools at issue in this case, MPEG LA and Via Licensing) distribute royalties on a per-patent basis. This structure generally provides equal compensation for any given patent in the pool, without regard to the technology of each patent, its merit, importance, or its contribution to the standard. This results in fundamental or broad patents being valued equal to weak or narrow patents.

481. The patent counting royalty allocation structure of pools does not take into consideration factors that are important to parties in real-world bilateral negotiations, including the value of the licensed portfolio and the extent to which customer demand is driven by that use.

XX. THE VIA LICENSING AND MPEG LA PATENT POOLS

482. The standardization of the first version of the H.264/AVC Standard was approved in March 2003. The standard was released in May of that year as H.264. On November 17, 2003, MPEG LA announced that essential H.264/MPEG-4 AVC patent and patent application

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holders had reached agreement on the terms of a joint patent license for implementation and use of ITU-T H.264 and MPEG-4 Part 10 AVC.

483. According to MPEG LA, 17 companies cooperated in negotiating the terms for its H.264 patent pool.[6] The current licensor count is 29.[7] According to the MPEG LA website, there are currently more than 1,100 licensees in good standing. Microsoft is both a licensor and licensee of the MPEG LA AVC/H.264 patent pool. Firms that have chosen not to include their SEPs in the pool include Nokia, Qualcomm, IBM and Thomson. In addition, MML, GI and Motorola, Inc. have not joined the MPEG LA AVC/H.264 patent pool.

484. The MPEG LA H.264 pool royalty rate is zero for the first 100,000 units per year, $0.20 for 100,000 to 5 million units per year, $0.10 for units above 5 million, with a cap on the maximum annual payment for an enterprise. The annual enterprise cap is $3.5 million in 2005-2006, $4.5 million in 2007-2008, $5 million in 2009-2010, and $6.5 million in 2011-2015.[8]

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[6] These companies include Columbia University, Electronics and Telecommunications Research Institute of Korea (ETRI), France Télécom, Fujitsu, LG Electronics, Matsushita, Mitsubishi, Microsoft, Motorola, Nokia, Philips, Robert Bosch GmbH, Samsung, Sharp, Sony, Toshiba, and Victor Company of Japan (JVC). Final terms were included in an agreement signed by only 14 licensors, including Columbia Innovation Enterprises; Electronics and Telecommunications Research Institute; France Télécom, société anonyme; Fujitsu Limited; Koninklijke Philips Electronics N.V.; Matsushita Electric Industrial Co., Ltd.; Microsoft Corporation; Mitsubishi Electric Corporation; Robert Bosch GmbH; Samsung Electronics Co., Ltd.; Sharp Kabushiki Kaisha; Sony Corporation; Toshiba Corporation; and Victor Company of Japan, Ltd.

[7] Current licensors include Apple Inc.; Cisco Systems Canada Co.; Cisco Technology, Inc.; DAEWOO Electronics Corporation; Dolby Laboratories Licensing Corporation; Electronics and Telecommunications Research Institute; France Télécom, société anonyme; Fraunhofer-Gesellschaft zur Foerderung der angewandten Forschung e.V.; Fujitsu Limited; Hewlett-Packard Company; Hitachi Consumer Electronics Co., Ltd.; JVC KENWOOD Corporation; Koninklijke Philips Electronics N.V.; LG Electronics Inc.; Microsoft Corporation; Mitsubishi Electric Corporation; NTT DOCOMO, INC.; Nippon Telegraph and Telephone Corporation; Panasonic Corporation; Polycom, Inc.; Robert Bosch GmbH; Samsung Electronics Co., Ltd.; Sedna Patent Services, LLC; Sharp Corporation; Siemens AG; Sony Corporation; Telefonaktiebolaget LM Ericsson; The Trustees of Columbia University in the City of New York ; and Toshiba Corporation.

[8] Another patent pool, administered by Sisvel, includes royalties for H.264 SVC essential patents. According to Sisvel, "For products that have no limitation in number of users, the royalty rate is Euro 0.50 per Input/Output interface through which H.264 SVC signals or files are transferred. For products that have a limitation on the number of users, the royalty rate is the maximum of either Euro 0.50 per Input/Output interface through which H.264 SVC signals or files are transferred or Euro 0.50 per user. For software, the royalty rate is Euro 0.50 per user. If it is established that the software is to be operated by a licensed product, any amount already paid by said product will be deducted from the royalty rate due for the software. For products and software that are intended solely for designing other devices, or solely for use in compliance testing, analyzing video streams or in laboratories, the rate is 0.25% of the average per unit selling price of the product or software."

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485. At a high level, royalties in the MPEG LA H.264 pool are shared among the licensors according to the following formula: (Number of Licensor Patents / Total Number of Patents in Pool) x Total Royalties in Country.

486. The IEEE 802.11 working group issued its first standard "IEEE 802.11" in 1997 (referred to as 802.11-1997). Subsequently, IEEE 802.11 has issued various amendments to the original standard including amendments for high-speed access at up to 54 Mbit/s (802.11a, 802.11b, and 802.11g), security (802.11i), quality of service (802.11e), higher throughput (802.11n), and other areas. The various amendments have been rolled into consolidated standards – IEEE 802.11, 1999 Edition (R2003) (in 2003), IEEE 802.11-2007 (in 2007) and IEEE 802.11-2012 (in 2012).

487. On March 2, 2004, Via Licensing Corporation announced that it held a first meeting of companies that hold patents essential for implementation of the IEEE 802.11 family of standards (the "IEEE 802.11 Standard") to begin the process of developing a joint licensing program.

488. Only five licensors joined the Via Licensing 802.11 pool when it was formed. Currently, there are only five licensors in the pool: Electronics and Telecommunications Research Institute (ETRI); Japan Radio Co., Ltd.; Koninklijke Philips Electronics N.V.; LG Electronics, Inc.; and Nippon Telegraph and Telephone Corporation.

489. It has been estimated that there are at least 85 holders of 802.11 SEPs. Thus, the vast majority of the firms holding SEPs, including MML and Microsoft, have not joined the pool as licensors.

490. The following companies are or have been licensees to the Via Licensing 802.11 pool: Archos, S.A.; Eastman Kodak; Enfora, L.P.; Fujitsu Ltd.; Guillemot Corp. S.A.; Imagination Technologies Ltd.; Japan Radio Co., Ltd.; Koninklijke Philips Electronics N.V.; LG Electronics; and Sony Corp. It has been estimated that there are hundreds (if not thousands) of implementers of the 802.11 standard. Thus, less than 1 percent of implementers of the 802.11 standard have joined the Via Licensing pool.

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491. The Via Licensing 802.11 pool charges rates ranging from $0.05 per unit to $0.55 per unit, depending on the number of units licensed annually. Specifically, the Via Licensing 802.11 pool charges $0.55 for 1 to 500,000 units; $0.50 for 500,001 to 1,000,000 units; $0.45 for 1,000,001 to 5,000,000 units; $0.30 for 5,000,001 to 10,000,000 units; $0.20 for 10,000,001 to 20,000,000 units; $0.10 20,000,001 to 40,000,000 units; and $0.05 for 40,000,001 or more. According to Appendix B: Schedule of Fees in the Via Licensing 802.11 Patent License Agreement, "[t]his rate structure was selected by the Licensors to avoid the difficulty and expense of implementing a more complex matrix of multiple rates dependent upon expiration dates, relative valuations and products."

492. Royalties in the Via Licensing 802.11 pool are shared among the licensors according to a Worldwide Revenue Sharing Algorithm. The algorithm includes a country-weight factor and divides revenue between licensors based on the relative number of patents each has contributed, adjusted by country.

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PROPOSED CONCLUSIONS OF LAW

I. THE PARTIES' LOAs

493. Motorola's various IEEE LOAs constitute enforceable contracts between the IEEE and Motorola and incorporate the IEEE's patent policies by reference.

494. Motorola's various ITU LOAs constitute enforceable contracts between the ITU and Motorola and incorporate the ITU's patent policies by reference.

495. Microsoft's various IEEE LOAs constitute enforceable contracts between the IEEE and Microsoft and incorporate the IEEE's patent policies by reference.

496. Microsoft's various ITU LOAs constitute enforceable contracts between the ITU and Microsoft and incorporate the ITU's patent policies by reference.

II. THE PROPER METHODOLOGY FOR DETERMINING RAND IN THIS CASE[9]

497. A hypothetical negotiation conducted in accordance with the *Georgia-Pacific* factors, modified for the specific circumstances of RAND negotiation generally, and the specific circumstances of the SEPs at issue in this case specifically, is the appropriate methodology for assessing RAND royalties. The hypothetical negotiation assumes that at least some of the Motorola and Microsoft standard essential patents are valid, enforceable and infringed by the respective parties and that at least some are essential to either the 802.11 or the H.264 standards. The hypothetical negotiation will take into account, where known, the real-world business considerations and circumstances of both Motorola and Microsoft. The terms and conditions negotiated will thus reflect the result that would be achieved by reasonable and prudent negotiators in this real-world setting.

498. A royalty that is based on a percentage of net selling price is an acceptable royalty base for a RAND license.

499. The Entire Market Value Rule is a limitation on patent damages and is not a limit on how the royalty in patent licenses are structured.

[9] As described in Motorola's pending motion for partial summary judgment, Motorola believes that the Court should not attempt to determine RAND terms in the absence of finding of breach of contract.

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500. A numeric proportionality approach to determining a royalty rate is inconsistent with the *ex ante* incremental value measure for RAND.

501. For a patent license to be a valid benchmark for a RAND rate for a patent portfolio, the patent license must include at least one of the patents in the portfolio.

502. Microsoft has the burden of establishing that Motorola's most recent offer was not RAND.

DATED this 4th day of October, 2012.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that on this day I electronically filed the foregoing with the Clerk of the Court using the CM/ECF system which will send notification of such filing to the following:

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